# Something for Everyone? The Different Approaches of Academic Disciplines to Open Educational Resources and the Effect on Widening Participation

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## Abstract

This article explores the relationship between academic disciplines' representation in the United Kingdom Open University's (OU) OpenLearn open educational resources (OER) repository and in the OU's fee-paying curriculum. Becher's (1989) typology was used to subdivide the OpenLearn and OU fee-paying curriculum content into four disciplinary categories: Hard Pure (e.g., Science), Hard Applied (e.g., Technology), Soft Pure (e.g., Arts) and Soft Applied (e.g., Education). It was found that while Hard Pure and Hard Applied disciplines enjoy an increased share of the OER curriculum, Soft Applied disciplines are under-represented as OER. Possible reasons for this disparity are proposed and Becher's typology is adapted to be more appropriate to 21st-century higher education.

**Keywords:**  open educational resources; OER; widening participation; work-based learning; education; distance education; e-learning; open education; open learning; online learning; educational inclusion; disciplinary differences; study skills; OER repositories

## Introduction and rationale

Globally, it is increasingly argued that open educational resources (OER) and practices can offer considerable benefits to individuals, educators, and institutions. For example, they can help widen access to education by making high-quality learning materials available without cost to the end user (Geser, 2007, p. 21). Individuals are therefore able to learn about topics which interest them and which are relevant to their lives, irrespective of their geographical location, financial status, educational background, and/or other life commitments. Geser (2007) suggests that as a result OER have the potential to "bring education and lifelong learning closer to the demands of the knowledge society" (p.121) and to "foster lifelong learning and social inclusion through easy access to resources that may otherwise not be accessible by potential user groups" (p. 21). Furthermore, the institutions and individuals creating and publishing OER can benefit by being "rewarded through increased status and visibility, and increased demand for other services and products" (Schmidt, 2007, section 3.3, para. 5). It should be noted, however, that concerns have been voiced about the lack of sustainable business models for the production and distribution of OER (e.g., Larsen & Vincent-Lancrin, 2005). Detractors of OER often ask who is going to pay for the authoring, maintenance, and distribution of materials that are available free of charge, and also suggest that the availability of OER may make some students reluctant to pay for higher

education. Downes (2011) explores a range of alternative business models, concluding that some models "are well on the way to demonstrating the viability of OER" (p. 63).

Thus far, the emphasis in OER production has been on quantity rather than the ways in which OER might be used and, historically, OER-related research has also tended to prioritise exploration of resource production rather than OER use. In 2008 Guthrie, Griffiths, and Maron asserted that "understanding user needs is paramount but often neglected" (p. 20). Increasingly, however, this perspective is shifting to consider the practices of existing OER users and the requirements of potential users (e.g., Wolfenden, 2011). The research reported in this article was intended to contribute to the growing body of research on OER use, seeking to explore whether potential OER users are equally served by the various academic disciplines represented in OER repositories such as OpenLearn ([www.openlearn.open.ac.uk](www.openlearn.open.ac.uk)) and Jorum ([www.jorum.ac.uk](www.jorum.ac.uk)).

Commonly, OER repositories give no clear indication of the criteria used to select materials for release as OER, nor of whether different disciplines approach the selection and release process in different ways. In addition, Geser (2007) notes that:

> Many promoters of Open Educational Resources (OER) do not take into account the legacy of traditional institutional frameworks and pedagogical models. They seem to assume implicitly that easy and free access to a "critical mass of high-value content" (which appears as a standard formula), and tools to make use of such content interactively, would somehow also lead to a change in such frameworks and models. Pedagogical models are often not even considered in the discussion of OER. (p. 41)

Now that a critical mass is being achieved in the production and availability of OER, it is possible to explore the published resources to identify any patterns that reveal possible differences between academic disciplines in terms of their approaches to the selection and release of OER. Any disparity in the quality and quantity of OER provision has the potential to advantage those users who have more and better resources in their subject area. At the same time it denies other users the opportunity to realise the full benefits of OER, thereby compromising the aims of the OER movement: ". . . a world where each and every person on earth can access and contribute to the sum of all human knowledge" (Cape Town Open Education Declaration, 2007, para. 1).

## Context

This article reports the findings of a study exploring the relationship between academic disciplines' representation in the UK Open University's (OU) OpenLearn repository and in the OU's fee-paying curriculum at undergraduate level. This narrow focus on a U Kingdom OER repository was intended to allow a manageable initial study that could be replicated internationally for other OER repositories. Because both researchers are familiar with the OU context it was logical to draw on this experience and to focus on the OpenLearn repository. Furthermore, the modular structure of the OU fee-paying curriculum and of Open Learn, discussed further below, offered the advantage of allowing straightforward counting and subsequent comparison of the two curriculum areas. We chose to focus on the undergraduate curriculum because it is studied by over 90% of the OU's student body (The Open University, 2009).

The OU is the biggest university in the United Kingdom, with approximately 250,000 students and about 570 modules on offer (The Open University, 2011). The academic provision of the OU is managed by its 10 faculties, schools, and institutes[1] which are centrally based at the OU's

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[1] These comprise the Faculty of Arts; the Open University Business School; the Faculty of Education and Language Studies; the Faculty of Health and Social Care; the Open University Law School; the Faculty of Mathematics,

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campus in Milton Keynes but have additional academic staff in each of the OU's 13 regional and national centres. The OU delivers its undergraduate curriculum through a process of distance learning whereby core module teaching texts are supported by face-to-face and online group tuition and individual/group telephone tuition, delivered by a body of over 7000 tutors operating in the OU's 13 regions. This tuition system is embedded in a framework of assessment. The OU's undergraduate curriculum is modular in structure, with programmes being subdivided into discrete modules of between 10 and 60 credit points, at levels 1, 2, and 3.[2]

The OpenLearn OER repository is hosted by the OU. It is entirely online, free to use, and accessible to all. OpenLearn comprises two types of learning materials:

1. extracts from the past and present OU fee-paying curriculum—these include text-based resources as well as audio and video materials
2. resources especially created for use in OpenLearn.

Like the OU fee-paying curriculum, OpenLearn is organised on a modular basis, categorised by level and by the number of study hours associated with each learning resource.

## Theoretical background

It was intended, from the start, for the OU study to be the basis for an extended exploration of academic disciplines' representation as OER in other contexts. As universities' curricula vary widely in the way they are categorised, both in the United Kingdom and internationally, a standardised method of comparing such curricula was required. The typology of academic disciplines derived by Becher (1989) from the earlier work of Biglan (1973a, 1973b) offered a uniform way of categorising the content of disparate curricula to allow a comparison between academic disciplines' representation in the fee-paying curriculum and as OER, both within and across institutions. Becher's typology is informed by the related theory of 'academic tribes' (Becher, 1989, 1994; Becher & Trowler, 2001; Biglan, 1973b; Neuman, Parry, & Becher, 2002) which has long been applied to researching disciplinary differences in academia and remains an enduring strand of investigation. Discipline-related differences have been identified in various areas of academic practice, including academics' relationship to knowledge, the relationship between learners and educators, and the type of knowledge that learners are expected to gain about their subject (Kemp & Jones, 2007).

Neuman, Parry, and Becher (2002, drawing on Becher, 1994) cluster academic disciplines into four main groupings: Hard Pure, Soft Pure, Hard Applied, and Soft Applied—each with their own epistemological characteristics. They refer to this structure as the 'Becher–Biglan typology'.

Table 1 gives more detail about each grouping.

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Computing and Technology; the Faculty of Science; the Faculty of Social Sciences; the Institute of Educational Technology; and the Knowledge Media Institute.

[2] One OU credit point represents about 10 hours of study. The credit points system used by the OU is aligned to the United Kingdom's Credit Accumulation and Transfer System (CATS). A typical OU honours degree requires a total of 360 points and, from 2012, will cost £15,000.

**Table 1** The Becher–Biglan typology

| Disciplinary group | Nature of knowledge |
|---|---|
| Hard Pure (e.g., Physics, Chemistry) | "Cumulative, atomistic structure, concerned with universals, simplification and a quantitative emphasis. Knowledge communities tend to be competitive but gregarious: joint or multiple authorship is commonplace" (Neuman, Parry, & Becher, 2002, p. 406). |
| Soft Pure (e.g., History, Literature) | "Reiterative, holistic, concerned with particulars and having a qualitative bias. There is no sense of superseded knowledge, as in Hard Pure fields. Scholarly enquiry is typically a solitary pursuit, manifesting only a limited overlap of interest between researchers" (p. 406). |
| Hard Applied (e.g., Technology) | "Derives its underpinnings from Hard Pure enquiry" and "is concerned with mastery of the physical environment and geared towards products and techniques". Neuman, Parry, and Becher point out that "applied knowledge communities, especially Hard Applied ones, are also gregarious, with multiple influences and interactions on both their teaching and research activity" (p. 406). |
| Soft Applied (e.g., Education, Business Studies) | "Dependent on Soft Pure knowledge, being concerned with the enhancement of professional practice and aiming to yield protocols and procedures". In common with Hard Applied disciplines, Soft Applied disciplines also feature "multiple influences and interactions on both their teaching and research activity" (p. 406). |

The continued relevance of the Becher–Biglan typology and the concept of academic tribes to 21st-century higher education are shown by their more recent application to modern learning technologies. For example, Kemp and Jones (2007) have employed the Becher–Biglan typology when studying academic use of (non-OER) digital resources. While much of the academic tribes research is based in the United Kingdom, the concept has currency on an international scale. Arbaugh, Bangert, and Cleveland-Innes (2010), based in the United States, use the Becher–Biglan typology when exploring disciplinary differences within a 'Community of Inquiry' framework, applying this to online learning with the virtual learning environment (VLE) tool Web CT. Gorsky, Caspi, Antonovsky, Blau, and Mansur (2010) have explored disciplinary differences in student behaviour in Moodle forums in the context of the Israeli Open University and, of particular relevance, Creaser et al. (2010) assess disciplinary differences in the provision of OER, arguing that OER repositories vary from discipline to discipline.

## Methods

The first stage of the research process for the current study involved ascertaining the percentage proportion of the fee-paying and OER curricula represented by each of the academic disciplines. This involved counting the content of both curriculum areas on a specific date: 1 July 2011. We took this 'snapshot' approach because the content of both curricula is constantly changing as materials and modules are added and removed.

We first calculated the total number of CATS points represented by the OU fee-paying curriculum. We then subdivided the fee-paying curriculum by academic discipline and calculated each discipline's percentage share of the curriculum as a whole, as shown in Figure 1.
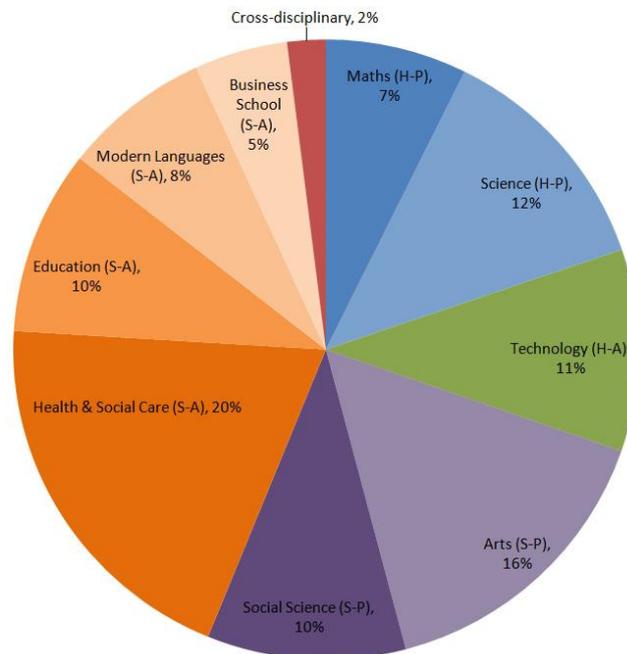


**Figure 1** Academic disciplines' representation in the OU fee-paying undergraduate curriculum on 1 July 2011 (H-P: Hard Pure; H-A: Hard Applied; S-P: Soft Pure; S-A: Soft Applied)

Next, we calculated the total study hours for the OpenLearn OER study units; then, as with the fee-paying curriculum, we subdivided OpenLearn by academic discipline and calculated each discipline's percentage share of the OER curriculum as a whole (see Figure 2).
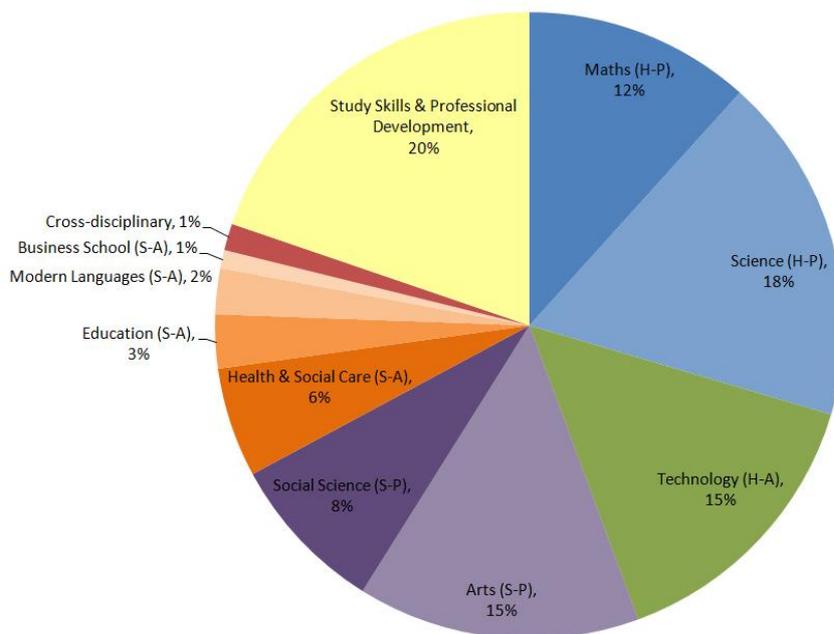


**Figure 2** Academic disciplines' representation in the OpenLearn undergraduate curriculum on 1 July 2011 (H-P: Hard Pure; H-A: Hard Applied; S-P: Soft Pure; S-A: Soft Applied)

Finally, having calculated each discipline's percentage share of the fee-paying and OER curricula, we allocated the disciplines represented in the fee-paying curriculum to the categories in the Becher–Biglan typology. Our categorisation decisions are shown in Table 2.

**Table 2** Categorising the OU disciplines according to the Becher–Biglan typology

| Hard Pure | Hard Applied |
|---|---|
| <ul><li>Maths (including Statistics)</li><li>Science (including Chemistry and Analytical Sciences, Earth and Environmental Sciences, Life Sciences, Physics and Astronomy)</li></ul> | <ul><li>Technology (including Computing, Design, Environment, Engineering)</li></ul> |
| **Soft Pure** | **Soft Applied** |
| <ul><li>Social Sciences (including Economics, Geography, Politics and International Studies, Psychology, Sociology, Social Policy and Criminology).</li><li>Arts (including Art History, Classical Studies, English, History, Music, Philosophy and Religious Studies).</li></ul> | <ul><li>Education</li><li>Modern Languages</li><li>Health and Social Care (including Nursing, Social Work and Youth Justice)</li><li>Business School (including Law)</li></ul> |

It is worth pointing out, however, that the categorisations in Table 2 are neither uniform nor exact within the OU or across higher education in the United Kingdom and internationally. For example, White and Licardi (2006) place Linguistics in three different categories—Hard Pure, Soft Pure, and Soft Applied—in a single eight-page conference paper. In addition, historically, disciplines have been variously clustered. For example, the OU's Faculty of Mathematics, Computing and Technology (MCT) was formed in 2007 from the former Faculty of Mathematics and Computing and the former Faculty of Technology. Becher and Trowler (2001, p. 39) confirm that it is not always straightforward to determine *a priori* whether a particular discipline is Pure or Applied because different aspects of the subject area are often given different emphasis by individual researchers and by different university departments. A further complication is that the OU curriculum includes cross-disciplinary modules, some of which span two or more of the Becher–Biglan typology categories. The categorisation of such cross-disciplinary modules is further discussed later. However, despite these categorisation problems most of the OU fee-paying curriculum could be allocated to discrete categories in the Becher–Biglan typology.

The undergraduate-level OER in OpenLearn were also subdivided using the categorisation presented in Table 2. Again, OER from the cross-disciplinary modules did not easily fit the Becher–Biglan typology. In addition, a further category of OER eluded such categorisation— these were non-credit-bearing study skills and professional development units, many of which do not appear in the OU fee-paying curriculum.

## Findings

Having calculated the percentage share of the fee-paying and OER curriculum represented by each discipline, and allocated the disciplines to the Becher–Biglan categories, we were then able to produce a graph comparing the fee-paying and OER curriculum share for each academic discipline (Figure 3).
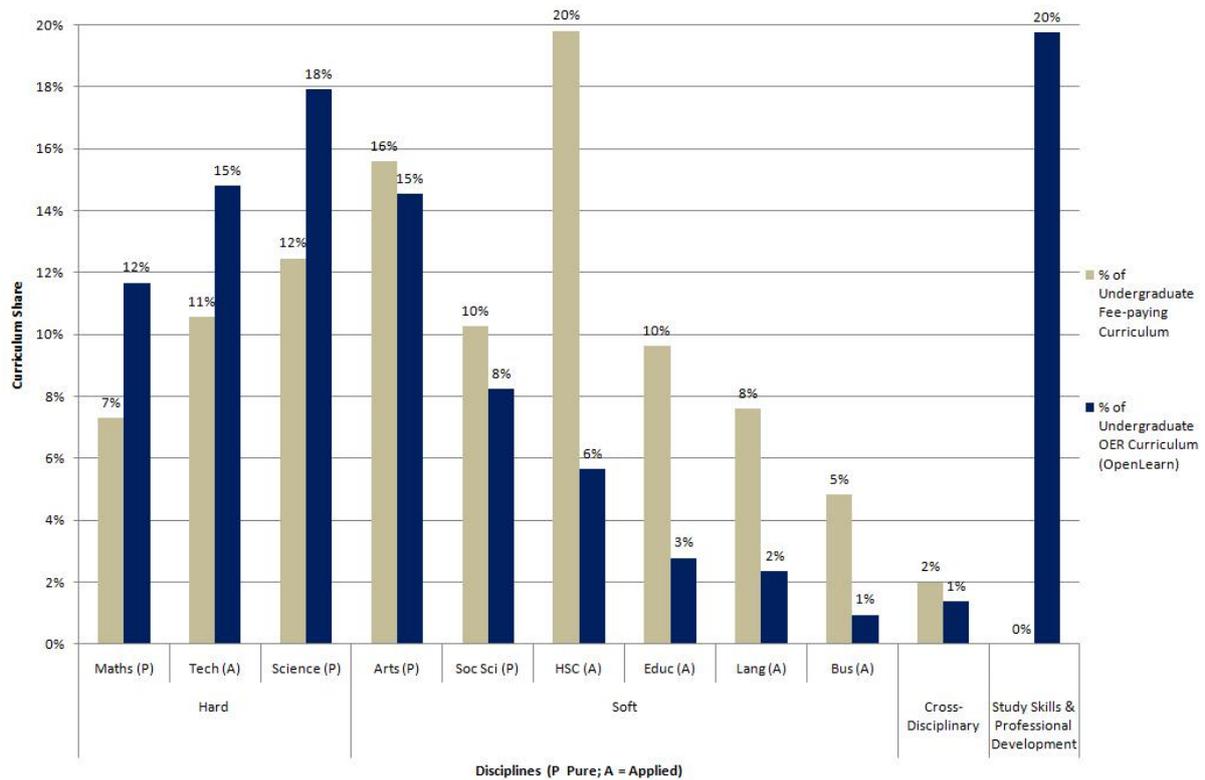
**Figure 3** Comparison of academic disciplines' representation in the OU fee-paying and OpenLearn undergraduate curricula

It was found that Hard Pure and Hard Applied disciplines such as Maths, Technology, and Science enjoy increased representation in the OER curriculum, gaining 5%, 4%, and 6% of the OER curriculum respectively. Soft Pure disciplines such as Social Sciences and Arts maintain an OER share that is roughly proportionate to the fee-paying curriculum (a 1% decrease in OER curriculum share for Arts and a 2% decrease in curriculum share for Social Sciences). However, Soft Applied disciplines, particularly Health and Social Care, are under-represented as OER, showing a marked decrease in curriculum share (14% for Health and Social Care, 7% for Education, 6% for Languages, and 4% for the Business School). The cross-disciplinary modules show a 1% decrease in curriculum share as OER. Of particular interest, however, is the fact that the largest share of the OER curriculum (20%) is held by generic study skills and professional development modules which do not appear in the fee-paying curriculum.

## Significance and interpretation

The findings summarised above were explored in the light of existing research into disciplinary differences in order to reach some understanding of the reasons for the disparity of OER representation across academic disciplines. It was concluded that a combination of factors may be at play, including the practical requirements of studying particular disciplines, the ways in which learning might be assessed, the demands of work-based learning, licensing restrictions, knowledge currency, disciplinary differences in academics' views about the quantity and type of knowledge students are expected to acquire and retain, differences in qualification structure and existing e-learning practice, funding drivers, economic considerations, the perceived difficulty of releasing as OER materials intended for use in work-based learning, and the existence of subject-specific OER repositories. The study findings also led to our considering whether the Becher–Biglan typology should be adapted to be more appropriate to 21st-century higher-education institutions.

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# Practical requirements of studying particular disciplines

Some academic disciplines, notably Science and vocational subjects such as Social Work, are notable for the practical requirements involved in their study. For example, studying Chemistry and Biology generally involves conducting laboratory-based experiments, and studying vocational subjects such as Social Work often requires at least some of the learning and assessment to be located in the workplace. The ever-more sophisticated technologies available via the Web—for example, audio, video, and interactive content such as wikis—make it possible to teach media-rich subjects such as the visual arts and music very effectively online. However, it is less straightforward to replicate a laboratory experiment online (though technologies in this area are being developed at the time of writing (see Lucas & Kolb, 2009). While we might anticipate that this would restrict the materials released as OER by Hard Pure disciplines (such as Chemistry) the findings discussed above do not appear to bear this out. A close examination of the content of existing OER would therefore be productive in revealing how practical experiments have been addressed (though this is beyond the scope of the current study).

The marked decrease in OER curriculum share shown by Soft Applied disciplines such as Health and Social Care could also be connected with the practical requirements of teaching related subjects and the difficulty of replicating face-to-face teaching and learning activities such as role-play as OER. Furthermore, social professions such as Social Work, Nursing, and Teaching tend to prioritise 'situated learning' (Vygotsky, 1978), whereby knowledge is gained from exploration and shared discussion of varied real-life experiences. Within the OU's Social Work curriculum, for example, attendance at face-to-face tutorials is compulsory for some modules, in part due to the learning opportunities offered by students sharing their personal experiences in different settings. Such situated learning may be perceived by Health and Social Care academics as difficult to convey online via OER and this could help to explain the discipline's low representation in OpenLearn. Again, this would merit further investigation in a future study.

## Assessment differences

An important feature of all teaching activities is the provision of regular formative assessment, which allows learners to assess their progress. Disciplinary differences in assessment practice might therefore be another reason for the disparity in disciplines' release of OER. Neuman et al. (2002) explain that Hard Pure subjects show a tendency to prefer "specific and closely focused examination questions to broader, essay-type assignments" (p. 408). They refer to Smart and Ethington's (1995) argument that "knowledge acquisition is emphasised more in Pure disciplines than Applied disciplines, while the latter attach more importance to knowledge application and integration" (Neuman et al., 2002, p. 408). While the discrete, quantitative, easily measurable assessment activities typical of Hard Pure disciplines lend themselves to reproduction in OER, the same is not necessarily so for the subjective essays and explanations used to assess knowledge application and integration in complex qualitative domains that are typical of Soft Pure and Soft Applied disciplinary groupings such as the Humanities and the Social Sciences. A close examination of the content of OER from different disciplines could be fruitful in informing a more detailed picture of the extent to which the assessment activities typical of each of the disciplinary groupings can be translated to OER format.

Furthermore, Neuman et al. (2002) add that Hard Pure disciplines show "little or no inclination to check assessors' judgements by double marking, or even to provide guidelines for marking or grading" (p. 408), again indicating that self-assessment activities, giving automated feedback, could easily be a feature of OER. The reverse may be perceived as true by academics working in Soft Pure and Soft Applied disciplines, where assessment activities can generate subjective and diverse answers. Consequently, in such disciplines guidelines for marking and grading are typically ambiguous because the outcome of the assessment process is often very specific to a learner's professional context or personal subjective interpretation. Giving automated feedback

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on these activities in the context of OER could prove tricky and might be a disincentive to releasing materials as OER. Further research might usefully explore this possibility in addition to investigating ways of providing meaningful, discipline-appropriate assessment for OER in Soft Pure and Soft Applied disciplines.

## Soft Applied disciplines, work-based learning, and OER

Soft Applied disciplines' under-representation as OER might also be related to the fact that such subjects often have distinctive requirements and characteristics connected with work-based learning (WBL)—learning that takes place outside the university and relates to employment. WBL occupies an ever-growing share of the higher education curriculum in most UK universities (Tallantyne, 2008), partly as a result of the increased emphasis on employer engagement, and is mostly (but not exclusively) found in Soft Applied subjects. It differs from the work placements that are typically found in Hard Applied subjects such as engineering, design, and computing in that in WBL students' performance is assessed in the workplace rather than the workplace being solely a location for learning. Consequently, the process of assessment is subjective and focuses on individuals' unique work experiences, paralleling the overall tendency towards subjectivity in assessment found throughout the Soft knowledge groupings. (It has already been noted that this may be a disincentive to releasing materials as OER due to the perceived difficulty of giving automated feedback.)

## Licensing restrictions

The licensing restrictions of some subjects might also affect their releasing materials as OER. For example, it is not uncommon for module materials for some Soft Applied disciplines to be co-authored with professional bodies such as the United Kingdom's College of Law and Royal College of Nursing. Negotiating the rights for re-use of these materials as OER can be complex.

## Knowledge currency

The low representation of Soft Applied disciplines such as Health and Social Care, Business Studies, and Education in OER repositories could also be connected with the fact that knowledge associated with these disciplines can go out of date very quickly. Examples might include Health and Social Care module materials that give details of welfare benefit regimes, or Business Studies materials that describe tax regimes. Kemp and Jones (2007), exploring disciplinary differences in the use of digital resources, discuss the issue of knowledge currency in some detail. They cite a language lecturer's comments that "things in Spanish change very, very rapidly and what we teach from year to year . . . changes as well" (p. 55). This may be compared with a mathematics lecturer's observation that "mathematical papers do tend to have a very long shelf-life" (p. 57). Arguably, then, a labour-intensive process of maintenance would be required to keep such OER up to date and this could be perceived as burdensome by already time-challenged academics. Relevantly, Hativa (1997) found that academics in Soft Pure and Soft Applied fields present their students with more recent knowledge than those in Hard Pure and Hard Applied areas, with Hard Pure fields presenting the oldest knowledge. Hativa suggests that this may be related to the hierarchical structure of knowledge in Hard Pure fields, where the more current knowledge is taught at higher undergraduate and postgraduate levels. The current study's focus on the undergraduate curriculum would be relevant here.

## Academics' views about the quantity and type of knowledge students are expected to acquire

The disparity in OER representation shown in Figure 3 may also be connected with disciplinary differences in academics' views about the quantity and type of knowledge students are expected to acquire and retain. Neuman et al. (2002) point out that Hard Pure disciplines feature linear cumulative knowledge domains and therefore "the determination of teaching content is relatively straightforward and uncontentious" (p. 410). They add that Hard Applied fields such as Technology show similar characteristics, with relatively fixed knowledge bases, featuring an emphasis on "progressive mastery of techniques in a linear sequence, based on factual understanding" (p. 412). Discussing Carnegie Mellon's Open Learning Initiative (OLI), Walsh (2011) suggests that the institution was "wise" in its focus on content such as introductory statistics, "in which there are more or less standard notions of core content and at least something approaching a 'single right answer' to many questions" (p. xii).

In more loosely structured Soft Pure domains, "much subject matter is open to interpretation and debate" (Neuman, et al., 2002, p. 411) and is more "free-ranging and qualitative" (p. 412) with teaching and learning activities tending to be "largely constructive and interpretative" (p. 408), drawing on a knowledge base that is less fixed than in Hard Pure domains. Parallels can be drawn with Spiro, Vispoel, Schmitz, Samapungavan, and Boerger's (1987) cognitive flexibility theory, which identifies two broad types of knowledge domain—"complex and ill-structured" (p. 1) and "well-structured" (p. 2)—each demanding different approaches to teaching and learning. Spiro et al. suggest that in well-structured domains such as Science and Mathematics, knowledge transfer occurs by retrieving generalisations or principles that apply to multiple cases of the phenomena being studied. However, in ill-structured domains such as Soft Pure Arts and Social Sciences disciplines, knowledge is gained by studying individual cases and there are few broad generalisations that apply to most cases. Kemp and Jones (2007) assert that such subjects tend not to have "an agreed and stable canon for teaching" other than in "the application of agreed principles and academic practices to current issues" (p. 56). It is possible, then, that the task of selecting materials to release as OER is simpler in Hard Pure and Hard Applied domains than in Soft Pure domains; hence the over-representation of the former in comparison with their fee-paying curriculum share. Discussing Carnegie Mellon's Open Learning Initiative (OLI), Walsh (2011) makes a pertinent comment when asserting that "it is far from clear to me that the OLI approach would be as useful in teaching subjects that generally require much more nuanced discussion, such as literature, ethics, and international politics" (p. xii). In support of her assertion, Walsh (2011) cites a professor of history's admission that she is "sceptical" that the OLI "would be an equally good format across all disciplines" (p. 98) and could not picture her own course on immigration history being adapted into OLI format.

## Differences in qualification structure

Disciplines' qualification structures may also account for the disparity in representation as OER. For example, it is possible that academics in Soft Applied subjects such as Nursing and Social Work, where most learning is oriented towards gaining a licence to perform a particular job, may believe that there is no point in giving away selected module materials as OER when a student needs to study a complete programme to gain a qualification and licence to practice. This may be contrasted with the Arts, where it is more common for people to learn solely for pleasure, and the Sciences where people may learn to pursue an interest rather than to gain a vocational qualification, especially in the specific context of the OU.

## Existing e-learning practice

Existing research into disciplinary differences in the use of e-learning (e.g., Arbaugh, et al., 2010; Smith, Heindel, & Torres-Ayala, 2008) may also help to explain the disparity of academic disciplines' representation as OER. Smith et al. (2008) suggest that "e-learning in Pure

disciplines has become more commoditized" (p. 152), and focuses particularly on the provision and use of discrete learning objects such as academic journals and online databases. In contrast, it is argued that Applied disciplines are more oriented towards 'diversified' community-based e-learning resources such as online forums and collaborative authoring. These findings may help to explain the disparity of OER representation between different disciplines. For example, academics in Pure disciplines may, consciously or unconsciously, judge the release of OER as having parallels with their existing use of "commoditized" e-learning resources. Conversely, academics in Applied disciplines may deem learning objects such as those appearing as OER to be less important than the collaborative interpretation and sense-making activities that are possible in community-focused e-learning resources.

## Funding drivers and economic considerations

Funding drivers may also inform the release of OER in some disciplines. For example, disciplines that are heavily research-focused (such as Science, Technology, and Medicine) are often required to meet targets for disseminating the outcomes of their research. This may result in an academic culture that is already accustomed to sharing information for the greater good and for whom the release of OER is a natural progression. Additional economic considerations might also affect the release of OER where disciplines wish to sell their resources rather than make them available at no cost to the user.

## Subject-specific OER repositories

OpenLearn contains OER from a wide range of academic disciplines. However, some disciplines also have their own subject-specific repositories: for example, the Humanities repository HumBox (www.humbox.ac.uk), the Languages repository LORO (www.loro.open.ac.uk), and the Social Work repository SWAPBox (www.swapbox.ac.uk). The HumBox creators point out that "the importance of the subject dimension cannot be overstated in that it was the provision of a bespoke space for the humanities which appeared to cater for the particular needs of humanities disciplines" (Dickens et al., 2010, p. 43). It is possible, then, that some academics will identify primarily with their subject area, across institutional boundaries, and may be more inclined to deposit their resources in a subject-specific repository than in a multi-discipline repository such as OpenLearn.

# Implications

Beyond identifying a disparity in academic disciplines' representation in OpenLearn and suggesting possible reasons for this, the current study findings have possible implications for the currency of the Becher–Biglan typology in the context of 21st-century higher education. Figure 4 shows a working revision of the typology, informed by the evidence gathered from the OU OpenLearn study regarding the growing areas of generic study and information literacy skills.
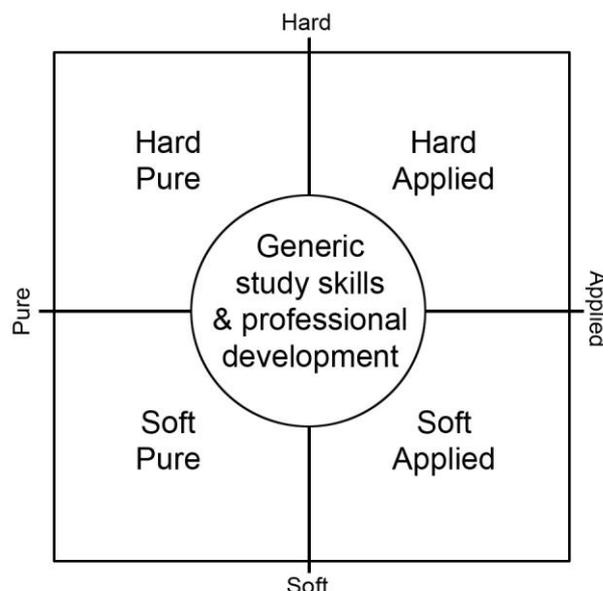
**Figure 4** Working revision of the Becher–Biglan typology

## Generic study skills and professional development materials

It was noted earlier that two areas of the OU undergraduate curriculum are not easily accommodated within the Becher–Biglan typology— namely, the cross-disciplinary modules that feature in both the fee-paying and OER curricula, and the generic study skills and professional development materials that are the largest single sector of OpenLearn. The cross-disciplinary modules comprise only 2% of the fee-paying curriculum and just 1% of the OER curriculum and they therefore have few implications for the continued currency of the Becher–Biglan typology. However, generic study skills and professional development materials occupy 20% of the OER curriculum, suggesting that the Becher–Biglan typology should be revised to accommodate the new shape of 21st-century higher education.

Many of the study skills and professional development materials in OpenLearn are discipline-independent: hence their placement at the centre of the working revision of the Becher–Biglan typology, indicating a core category of generic study and professional development skills that are relevant to all four knowledge groupings in the typology. The OpenLearn generic study skills and professional development materials can be subdivided into three categories:

1. materials that focus on generic study skills such as essay writing and revising for exams, together with the development of meta-cognitive strategies such as thinking skills
2. materials produced by the OU Library, and that focus on information and critical literacy, providing instruction in searching for and evaluating digital materials
3. materials that focus on professional development.

The generic study skills materials in OpenLearn are typical of an ever-growing emphasis in 21st-century higher education on developing subject-independent study skills and meta-cognitive learning strategies alongside subject-specific knowledge and skills. Allan and Clarke (2007) identify a "renewed impetus for supporting the development of students' learning in higher education" (p. 64) arising, in part, from the widening participation agenda that has been a priority for higher education in recent years. They suggest that the entry of students from a broad range of backgrounds and with disparate levels of previous academic experience demands "greater flexibility and innovation in learning and teaching in order to maximize the retention and successful completion of those who progress into HE", including an increased emphasis on

developing study skills. The presence of professional development materials in OpenLearn reflects a contemporary emphasis (e.g., Leitch, 2006) on developing higher-level skills for employment, (such as critical thinking, analysis, evaluation, and reflective practice) in the hope that these skills will help employees to adapt to changes in the workplace.

The materials produced by the OU Library are perhaps best explained in the context of research indicating a new role for librarians in producing study materials that relate to information literacy. Whitchurch (2010,) has already observed that the clear knowledge groupings ("territories") and disciplinary cultures ("tribes") featuring in the original Becher–Biglan typology have gradually become "less sustainable, not only between academic disciplines, but also between academics and other forms of professional activity" (p. 168). Law (2010) provides a pertinent example of such changing knowledge groupings when identifying a growing need for information professionals who will take charge of the selection, preservation, and curatorship of digital resources. He observes that "there is an obvious role for information services staff to develop new content systems and to revivify the fundamental skill of the organisation of knowledge" (Law, 2010, p. 196). Law tentatively suggests that such a role might be occupied by traditional librarians, citing Burke's (2002) assertion that:

> The practice of librarianship in the virtual library environment will not be very different from that in the traditional print-based library. The librarian's role will continue to include selection of suitable resources, providing access to such resources, offering instruction and assistance to patrons in interpreting resources, and preserving both the medium and the information contained therein. (Conclusion, para. 1)

The Library-produced materials in OpenLearn provide evidence of such practices.

It is important to point out that the proportion of study skills and professional development materials in OpenLearn may not be representative of other OER repositories. Further research is therefore needed before any definitive conclusions can be made regarding whether the Becher–Biglan typology requires adaptation or, indeed, whether a new model needs to be devised to better suit 21st-century higher education.

## Conclusion

In conclusion, the current study has shown that there is indeed a disparity between academic disciplines' representation as OER in OpenLearn. A number of possible reasons for this have been proposed and a working revision of the Becher–Biglan typology has been suggested in light of the study findings.

The study findings have implications for widening participation in that some people could be disadvantaged by the disparity in representation and the potential for OER use not being fully realised in certain disciplinary areas. In effect, it would be easier for an individual to pursue a coherent programme of study in some subjects than in others. Similarly, if a tutor wished to assemble a programme of study this would also be easier, cheaper, and faster in some subjects than others—cheaper if costly resources are available for free as OER, and faster if the repository is well stocked.

The current study also shows that if the OER movement's aims for widening access and participation in education are to be achieved, institutions need to actively monitor the disciplinary balance within their OER repositories to ensure that they serve the widest possible audience, especially users seeking resources in disciplines that are under-represented. Harley (2008), exploring the relationship between the creation and use of OER, observes a disparity between "what a potential pool of faculty users of digital resources say they need in undergraduate education and what those who produce those resources imagine as an ideal state"

(p. 197). The current study's exploration of possible disciplinary differences in the perceived obstacles to releasing materials as OERs could be valuable to institutions that do identify an imbalance in their own repositories.

It is also recommended that under-represented academic disciplines prioritise the release of OER, both to better promote their subject area and to help realise the aims of the OER movement in making high-quality learning materials available to people who may otherwise not have access to them. Arguably, this is particularly pertinent for exactly those academic disciplines which are under-represented in OpenLearn, especially in the context of contemporary cuts to higher-education funding in the United Kingdom. For example, it has been noted that Soft Pure disciplines such as the Arts are not as well represented in OpenLearn as are Hard Pure and Hard Applied disciplines. However, at the time of writing (July 2011) Arts and Humanities education, and the Arts in general, are experiencing huge funding cuts in the United Kingdom (O'Brien, 2011). Arguably then, the release of high quality Arts and Humanities OER can help to ensure that individuals are still able to enjoy the personal and social benefits of studying the Arts, which UNESCO (2006) proclaims are "essential components of a comprehensive education leading to the full development of the individual" (p. 1).

A similar case can be made for the Soft Applied disciplines to prioritise the release of OER. For example, Health and Social Care study materials have the potential to make a huge difference in equipping people to live in today's complex societies, to understand each other, and to cope with social and personal problems, irrespective of whether such materials are studied in the context of a formal study programme leading to a qualification or licence to practice. Future OER initiatives could usefully include working with academics from under-represented disciplines in developing and releasing materials.

Future research might build on the current study in exploring the possible reasons for disciplinary disparities in representation as OER through discussion with academics. It would also be insightful to replicate the current study in the context of other OER repositories, both nationally and internationally, to ascertain whether the OpenLearn findings are representative. Finally, it would be valuable for current OER research to be extended to include consideration of potential end users' wishes for the type of OER content they would find useful, to help ensure that OER have the maximum effect in widening participation in education.

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