# Research as a transferable skill in higher education

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*This paper explores the place of research training in higher education in the 21st century. It examines the changing position of research skills within higher education in recent years and looks for possible reasons for those changes. There are three main conclusions. First, training in research skills has been shifting down from doctoral programmes into Masters and increasingly into undergraduate programmes. Second, this development can be explained in terms of: a growing requirement for students to be able to plan and manage their own learning, changing trends in graduate employment; and the growth of a knowledge-based society. Third, research has become a transferable skill. The last of these conclusions has implications for the location of research within the higher education curriculum.*

Keywords: research training, undergraduate education, transferable skills

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**Introduction**

This paper is about the role of research training in higher education (HE). It aims to explore the position that research training occupies in HE in the 21st century. The focus of the paper is the undergraduate curriculum and it offers an answer to the question, 'should an *undergraduate* education in the 21st century include training in research skills?'

This is an important issue now for at least three reasons. First, the position of research skills within HE has been changing in recent years. Research skills have made inroads into Masters programmes and, more recently, the undergraduate curriculum which makes this a live

issue. Second, we live in an increasingly knowledge-based society so that the skills of knowledge acquisition and dissemination are required by more and more people within their employment. Third, outside the context of employment the increasing pace of change means that more and more people face problems that require the acquisition of new knowledge.

In other words, the role of research in HE has changed and continues to change and this has implications for its role within a university education. In view of this, there is a need to examine the nature of this change in the position that research occupies in HE and explore what further change, if any, is needed.

For the most part, this paper follows a student-centred approach; it examines the issue from the perspective of the advancement of students and, in particular, how it impacts on their preparation for life after graduation.

The main conclusions of this article are that: (1) training in research skills has been shifting down from research degrees into taught courses, initially into postgraduate and increasingly into undergraduate programmes; (2) that development can be explained in terms of the accelerating pace of change, including acceleration in the pace of accumulation and transmission of new knowledge; and (3) research is a transferable skill. The last of these conclusions has implications for its position within the HE curriculum.

**Background**

For the purposes of this paper, *research is the intentional creation of shared new knowledge*. Defined thus, research is a relative newcomer to HE. The discussion will be couched in terms of HE in Britain, but would need little change to apply equally to other countries.

The origins of the Western university can be traced back to the 11th century, when there was a need for more clergy and more educated clergy to support the rapidly expanding Latin Church (Bartlett, 1993:Ch 1). Throughout the medieval period the dominant goal of the university was to serve the Church and Latin Christendom. Accordingly, it sought to produce graduates equipped to serve the Latin Church as clergy or administrators to run its other organisations such as monasteries and hospitals and the institutions of canon law. To that end, it offered an education based on the trivium and quadrivium and knowledge of Holy Scripture. Unsurprisingly, research, as we define it, played little role in the universities of the Middle Ages.

At the end of the medieval period the universities of Western Europe gained a large measure of independence, including financial independence, from the Latin Church (Bourner, 2008). As a result, the dominant goal of the European university moved towards the education of students as an end in itself. In view of its clerical roots it naturally sought to produce *godly* gentlemen who would grace any profession or even none at all. The curriculum shifted towards the humanities, reflecting the influence of the Renaissance, through classical studies. During this period, higher education in the universities of Europe was placing greater emphasis on breadth of knowledge and the development of good manners and social graces.

Growing independence from the Latin Church gave those university teachers who were so inclined an opportunity to study a much wider range of subjects. During this period, the 'advancement of knowledge' in universities was, for the most part, focused on enlarging the domain of academic knowledge, that is, opening up new fields of enquiry and new academic subjects beyond those that prescribed by the Church.

The higher education offered by European universities was largely untroubled by the scientific revolution of the 17th century (Ashby, 1959, 1974). Science played a small role in university education or in the personal studies of most university teachers. In England, for example, the main role of universities continued to be the preparation of students for future positions in the Anglican Church and science was not seen as a necessary requirement for such posts.

The 19th century saw the emergence of a new model for the university. In 1810 William Von Humboldt founded the University of Berlin and gave it a new mission. According to Humboldt the purpose of a university was not to serve the needs of its students; rather it was the purpose of both students and staff in a university to serve the needs of the advancement of knowledge. In Humboldt's own words (in translation): 'the teacher no longer serves the purpose of the student. Instead both serve learning itself.' (Hutchins and Adler, 1969:350).

This is widely recognised as the origin of the modern university (see for example, Ruegg, 2004), and led eventually to the birth of the research university. It proved a successful development and German universities, which were held in particularly low esteem at the start of the 19th century (Perkin, 1997) were the leading universities in Europe by the start of the

20th century. Consequently, their lead was followed with greater or lesser reluctance by the other universities and when new universities were established they generally followed the Humboldtian model.

As the advancement of knowledge became the dominant mission of the university, the nature of a university education changed to reflect that mission. The undergraduate curriculum came to emphasize the acquisition of up-to-date knowledge and the development of critical faculties. This involved developing the capacity to test claims to the advancement of knowledge ie to evaluate assertions and evidence as the means by which claims to new knowledge are made. Emphasis on the advancement of knowledge in HE also led to increasing subject specialization and proliferation of new subjects and new degree courses.

New teaching and learning methods were developed to support this new mission. The university seminar was developed in 19th century Germany to support the training of science researchers. It gradually spread to other subjects, to other levels of HE and to other countries. For example, in 1918, at London University, a report titled *Post-graduate Work and Degrees in the University of London* recommended the adoption of seminars within the university (Simpson, 1983:157) but did not go so far as sanctioning the introduction of a PhD at that time.

The PhD had also been developed in German universities to train science researchers. This development spread only gradually to other subjects and other countries. For example, the first English university to award a Doctor of Philosophy degree was Oxford in 1920, a DPhil (Noble, 1994) and Cambridge followed a year later with the second doctoral award. In Australia, the first PhD was not awarded until 1948, at the University of Melbourne.

By the middle years of the 20th century a system of HE had been established that most academics today would probably view as the *traditional* system of HE. At its base was undergraduate HE, largely focused on acquiring the latest knowledge of an academic discipline and the development of critical faculties. In most fields, students who could successfully apply their critical faculties to the up-to-date knowledge of a recognised academic subject were judged worthy of a degree. At the top of this 'traditional' system was the PhD which provided training in research; its primary aim was to develop the capacity to make a significant

contribution to new knowledge.

The last decades of the 20th century saw many challenges to the traditional system of HE in which research training was reserved for the highest level of HE, ie PhD level. These years saw research training enter Masters courses so that by the end of the 20th century many Masters level courses had a research element (Harris Report, 1996) and nowadays many Masters degrees are not so much 'taught' courses as a combination of taught and research elements. Thereafter, research training also entered the final year of many undergraduate programmes. This practice has now become sufficiently widespread to support the publication of some books on research methods for undergraduates (see, for example, Wisker, 2009). Nowadays a research-based dissertation is seen as the capstone course of many undergraduate programmes.

In recent years, advocacy of the inclusion of research in undergraduate curriculum has been growing. In the UK, the main starting point seems to be been concern about the relationship between research and teaching. Positions ranged from the conventional wisdom within universities that higher education is enriched by research-led teaching to the heretical view that the research activity by academics actually detracts from good teaching:

> 'Put simply, someone who is not research-active is much more likely to be around – giving of their time and focusing on their students and their teaching, rather than buried in, and preoccupied by their research.' (Healey, Jenkins and Lea, 2014, p. 11)

In 1996 Hattie and Marsh reviewed the empirical evidence in a meta-analysis of studies of the relationship between research and teaching and reached a disturbing conclusion:

> 'Based on this review we concluded that the common belief that teaching and research were inextricably intertwined is an enduring myth. At best teaching and research are very loosely coupled.' (Hattie and Marsh, 1996, p. 529)

This had implications that universities found hard to accept. It undermined part of the rationale for research in so-called research universities and it provided support for teaching-only institutions of higher education. As a result, there was considerable work to bring together teaching and disciplinary research in order to find ways in which

disciplinary research could support the higher education of students and ways in which the teaching could support disciplinary research. See, for example, Elton, 2001.

Some of the academics engaged in this work went further than merely offering suggestions for realizing the aspirations of a research-led curriculum and were led to the idea of a research-based undergraduate curriculum as a way of linking research and teaching. Healey and Jenkins have produced a number of reports for the Higher Education Academy advocating the inclusion of research in the undergraduate curriculum (see, for example, Jenkins and Healey, 2005; Jenkins, A., Healey, M. and Zetter, R., 2007; Healey and Jenkins, 2009, Healey M, Jenkins A and Lea J, 2014).

As is so often the case, things have moved even faster and further in USA higher education. There is a Council on Undergraduate Research (CUR) in America with a membership of over 900 colleges and universities promoting and supporting 'undergraduate student-faculty collaborative research and scholarship'. The CUR defines research as 'an enquiry or investigation by an undergraduate student that makes an original intellectual or creative contribution to the discipline'. Some of the member institutions of the CUR have developed special 'undergraduate research programmes' for selected students, usually those with better academic results.

The main conclusions to be drawn from this background are that the 'traditional' position of research within the university is much more recent than is often appreciated, and recent decades have seen considerable movement of the position of research in the system of HE offered by UK universities.

It is clear that the position of research training in HE has changed significantly since the second half of the 20th century. These conclusions underpin the discussion in the next section about the proper role of research training in a university education in the 21st century. They raise the question about its most appropriate location within 21st century HE.

**Research training in university education**

The traditional form of research training in the high years of the 20th century was clear. It was provided by the PhD and was aimed primarily at university academics and those who aspired to careers as professional researchers in industry. The PhD was awarded to those who could provide evidence that they had developed the capacity to make a significant original contribution

to new knowledge. Most universities also made provision for the award of an MPhil for those who could provide evidence that they could carry out a competent research project even though it might not result in a significant contribution to new knowledge.

In this section, we take a different position. We argue that research is too important to be left to the small minority who are either fortunate enough to be funded for a higher degree, or who can afford to enrol on a doctorate or MPhil. We contend that research is a transferable skill that is needed by an increasing proportion of the population in the 21st century. We present three reasons why research skills should be part of the university education of every university student. They centre on three important goals of higher education: the ability to test ideas and evidence, preparing students for graduate employment and developing students' ability to plan and manage their own learning.

*Ability to test ideas and evidence*

Listening to the news, one frequently hears phrases such as 'research shows that...', particularly from politicians. But the speaker rarely says which research, by whom, about what, when, who commissioned it and whose interests were best served by it. Using the words 'research shows that' gives the impression of impartial, considered, peer reviewed analysis of an issue. The language of research, including the use of the word itself, conveys gravitas and an importance which defies ready questioning. Research has acquired a status that has led to it becoming an over-used term. Nevertheless, there is much evidence that the volume of research *has* grown, continues to grow, and is playing an increasingly important role in the lives of virtually everyone.

Two hundred years ago there was no such thing as a research university, most of the research that was undertaken was carried out by wealthy amateurs, and there was no PhD in the sense of a training for research. One hundred years later research had gained a firm foothold in most universities, even though most did not yet see training for research as part of their remit and still no English university had yet awarded a PhD. At that time, most university education still reflected the views of Cardinal Newman, who saw research as no part of a university education. Since that time, however, research has come to dominate most universities and it has extended into all walks of life.

One hundred years ago few business organisations engaged in any form of systematic research, except the relatively few engaged in science-based activities. Nowadays, nearly all business firms above the size of small-scale enterprises engage in some research, even in fields quite unrelated to science. There is much to support this statement but three pieces of evidence should suffice. First, some form of market research is undertaken by most organisations except the smallest. Second, research and development of new products and new processes can nowadays be found in business organisations in a wide range of fields. Third, business organisations often nowadays use research to solve business problems more generally and business strategy is often based on research. For example, it would normally be expected that the decision of a multinational to set up production in a new country would follow a research-based enquiry into that decision. The use of research by business organisations is a major development of the last 100 years.

Not only is research undertaken by more business organisations in a wider range of fields, but an increasing number of business organisations are entirely devoted to research. They include, for example, businesses in the life science industry testing new drugs, new cosmetics etc, organisational development businesses most of which base their practice on some form of action research, and many business consultancy firms. More generally, they include the whole of the market research industry and the 'survey and questionnaires' industry - firms with household names such as Gallup, Mori and YouGov. The number of polls and surveys conducted and reported grows annually. In the UK, the census, a major research project in its own right, has been joined by a large number of public opinion, mass observation and attitude and behaviour polls, which are conducted by a wide range of interested parties, and are the source of many news items.

The growth of research by business organisations is not confined to 'for-profit' organisations. Organisations in the public sector are also increasingly engaging in research. They need to be able to demonstrate for the purpose of public accountability that they are taking evidence-based decisions. Such organisations tend to be larger than average, as the propensity to engage in research rises with the size of the business organisation. It is not a coincidence that graduates tend to be employed in larger than average organisations. Other not-for-profit organisations such as charities also engage in or are entirely devoted to research, such as *Cancer Research* and the charity simply called *Action Research*.

Government has funded an increasing volume and range of research over the last 100 years. That range has gradually extended from the sciences into the social sciences and now covers all areas in which government is a stakeholder, including fields such as education, law and social support. In addition to funding research, government at both national and local levels increasingly engages in research itself, including projects involving extensions to the transport infrastructure, changes to the law and work associated with planning permissions. Again, public accountability favours such evidence-based decision-making.

Even political parties increasingly engage in research, including testing out ideas for policy initiatives, identifying the strength of public opinion and recording changes in public sentiments. Institutions known as 'think tanks' such as *Civitas*, *Demos* and the *King's Fund*, feed their ideas into government and political parties and might with justification be known as 'research tanks'.

Professional bodies normally favour evidence-based professional practice, and they affect in a positive way the best practice in their own professions. Consequently professional bodies now routinely undertake research, indeed it has become of one of the main functions of professional associations. These developments are reflected in the emergence of professional doctorates. The PhD is intended to produce professional researchers whereas professional doctorates are intended to produce researching professionals (Bourner *et al*, 2001). At the start of the 1990s it was difficult to find any English university that offered a professional doctorate. By the end of the 1990s it was difficult to find any that did not (Bourner, et al 2001a and 2001b) One of the most important roles of professional bodies is to carry out research on behalf of its members.

In addition to these associations a range of professional research institutes has grown up; these are establishments endowed for the purpose of research, normally independent of universities. To illustrate the number and range of these we can pick a single field, sleep, in a particular country, England, and find many such institutes, including the British Sleep Society, the National Sleep Foundation and the London Sleep Centre.

To these we can add a growing list of learned societies and learned associations that carry out research. Since the establishment of the first such

associations, including the Royal Society, in the 17th century these societies have proliferated in a range of fields of increasing variety. They exist to study particular topics so they naturally sponsor research, carry out research and disseminate the results of research.

Research is also an important role of other associations of individuals, organisations and even associations. Trade unions carry out research on behalf their members, and the Trade Unions Council (TUC) carries out research on behalf of its member trade unions. Trade associations undertake research for their constituent organisations. And multi-national bodies such as the OECD and, of course, the UN carry out large and increasing amounts of research.

At the other end of the spectrum, individuals are engaging in more personal research as they make decisions about important issues in their lives such as where to live, what to rent or buy, where to find work, which car to buy, which mobile phone to buy etc. Increasingly there is research available to assist the individual. For example, the number of online comparison and recommender web sites also grows annually. Sites as diverse as *Tripadvisor* for travel reviews, *Rotten Tomatoes* for film reviews and *Checkatrade* for plumbers and electricians are all examples of bottom up sharing of research and the findings. As individuals have access to more information there is increasing scope for systematic enquiry to make evidence-based decisions.

Googling the word 'research' in 2014 produced 217,000,000 hits. There is no doubt that the term 'research' is used to describe much that does not warrant the term, but there is also no doubt that we live increasingly research-based lives in an increasingly research-based world. Reflecting this central role of research, Sir Douglas Hague, chair of the Economic and Social Research Council in the last decade of the 20th century, said: 'Academics must believe that acquiring the ability to test ideas and evidence is the primary benefit of a university education.' (Hague, 1991:64).

How can universities help students develop their capacity to test ideas and evidence? 'Critical thinking' was the answer that emerged 100 years ago when the concept of the research university was supplanting Newman's idea of a university with its implications for university education. Honing the critical faculties of students was adequate at a time when research

impinged little on the lives of most people, but we now live in a world that is much more research-based, knowledge-dependent and immersed much more in evidence-based theory and practice. As the world becomes ever more interconnected, literacy rates rise, world-wide rates of graduation increase in an expanding population, and as the amount of research undertaken globally and the worldwide stock of knowledge increases, it is evident that future generations of graduates will live in a world that is even more research-based and knowledge-dependent. Karl Popper's 'World Three' (Popper, 1978), comprising products of the human mind, is expanding more and more quickly and new graduates will spend an increasing amount of their time in that world. At such a time we need to go further than just developing critical faculties of students – we need to introduce them to the research process itself.

As research-based knowledge expands, the ability to test ideas and evidence becomes increasingly important. Today's graduates face an avalanche of 'new knowledge' – far more than when nearly all new knowledge advanced via reports of research published in peer-reviewed academic journals. Nowadays many more sources claim to be distributing new knowledge, ranging from research reports published on-line to the relatively new alerting services, also on-line, that report the conclusions of new published research.

To make sense of the growing volume of research and other evidence-based knowledge, it is increasingly important for graduates to have a good appreciation of the research process itself. A student who has experienced all the stages of the research process - problem-formulation, critical review of what is 'known' already about the issue in question, conducting an actual investigation, making sense of the findings to produce reasoned conclusions, identifying implications of the results - is in a much better position to evaluate and interpret research-based evidence and ideas.

*Preparing students for graduate employment*

Graduate jobs are disproportionately located within areas most involved in the production, dissemination and application of new knowledge: research is the source of much of that new knowledge.

Paradoxically, as the age participation rate has risen over recent decades a decreasing proportion of new graduates has gone into destinations for which subject knowledge of their first degree is a prerequisite. A study by Bourner

and Rospigliosi (2008) of the changes in the pattern of the first destinations of university graduates since destinations data were first published found that in the 1960s about six out of ten graduates remained within the education system after graduation, going on to teaching, research, further academic study, teacher training, other training or education administration. Now that ratio is down to about three out of ten. The main reason for this is the huge rise in the HE age-participation rate over that period. Most graduates now find jobs in other sectors, including industry, wholesale/retail, financial services, other commerce and public services other than education. Moreover, most employers in these other sectors are not much concerned about whether the academic knowledge of the students they recruit is up to date. Indeed, most employers of graduates are not even much concerned about the degree subject: most vacancies (around two-thirds in some years) for graduates each year ask for graduates in any subject:

> 'Of course, there are many students who find employment in an area directly related to their degree courses. Engineers become engineers, medical students become physicians, some linguists become interpreters and translators … But it is also true that every year between 40 percent and 70 percent of all graduate vacancies ask for a degree in any discipline because the knowledge content of the student's degree is immaterial to the position.' (Roberts, 2006:12)

It would seem that most graduate employers are less concerned with what graduates have learned at university than with what they will learn in their employment. Bourner, Greener and Rospigliosi (2011) concluded that the main reason for the so-called 'graduate premium' is that graduates have an enhanced capacity for learning. According to Rospigliosi et al (2014) this enhanced capacity is partly what secured their places at university (as signaling theory predicts) and is partly developed by university education (as human capital theory predicts). Evidence-based knowledge and practice are increasingly found in knowledge-based employment, which is where graduates are disproportionately located.

Some graduates, of course, remain within the education system after graduation, going into teaching, research, further academic study, teacher training, other training or education administration. Others acquire jobs that increasingly involve the production, distribution and/or application of knowledge, but not necessarily in the subject of their degree studies. There

are probably be very few graduates who find jobs that do not involve the production of new knowledge at some point(s)in their graduate careers. From this perspective, the development of student capacity to engage successfully in research can make the students more attractive to the employers of graduates and better prepared for graduate employment itself.

There is another reason why research skills can contribute to successful graduate employment outcomes. The search for graduate employment itself can be conceptualised as a research project in its own right; it involves acquiring new knowledge, developing ideas about potential fields of employment, testing those ideas, interpreting the outcomes of that testing and drawing conclusions and implications, including implications for further job search. Students who have had the experience of completing at least a small-scale research project can use this experience and lessons learned for the project that faces them as they reach the end of the university education ie finding a suitable graduate employment position.

*Autonomous learners and lifelong learning*

According to Zuber-Skerrett (1992), the highest purpose of higher education is to help students become graduates who are independent learners who can plan and manage their own learning:

'…our ultimate goal in higher education must be to encourage students to be responsible for, and in control of their own learning …' (Zuber-Skerrett, 1992:24).

This is the ultimate goal because: it flows from the defining characteristic of higher education:, it prepares students for lifelong learning after graduating,; and developing students' ability to plan and manage their own learning is increasingly important as the pace at which the world changes accelerates. We will examine each of these assertions in turn.

*The defining characteristic of higher education.*

Higher education is understood by most people to be education which is situated above secondary and primary school levels, and for most people is epitomised by the education provided by universities.

In some subject areas there is a clear progression in terms of subject content. For example, mathematics at university requires prior knowledge of secondary school mathematics, which requires knowledge of primary school mathematics. In other subject areas, however, it is possible to start

the study of an academic subject at university without knowledge of that subject at lower (ie secondary and primary) levels. For example, it is possible to enrol on a degree in anthropology at many universities without having studied the subject at primary or secondary level. At the University of Bristol it is possible to apply for that subject at Masters level without having studied it undergraduate level. This implies that subject knowledge *per se* is not the defining criterion of higher education. What *does* happen as one progresses up the levels of education is that teachers gradually relinquish control of the learning process and allow students to take more control of their own learning.

As one moves up the education ladder the amount of self-direction of student learning increases steadily. Many of us can remember chanting multiplication tables in primary school under the instruction of teachers who specified what we learned and how we learned and supervised the actual learning process itself, in that particular case repetition through chanting. In secondary school, students have more freedom to decide how they will learn, more so at the top (A-level classes) than at the bottom (year 7 classes).

In higher education there is more freedom still; students choose what they will study in higher education from an extensive range of subjects and have much discretion about how they study. New students at university find that higher education is more self-directed than school education. Moreover, it becomes even more self-directed as students pass from first year through intermediate levels towards graduation. Universities tend to provide most academic direction and support to first year students as most of them are making the transition from school to university (or from work to university, in the case of mature students). The amount of academic direction is normally reduced at intermediate levels and even more so at the final level of undergraduate education. At Masters level students are expected to require even less direction of their learning than at undergraduate level. At the highest level of all, doctoral level, students not only plan and manage their own learning, they also usually determine the intended learning outcomes ie what they aim to discover through their research.

In other words, as students move up the levels of education they are able, and expected, to take more control over and responsibility for their own learning.

*Preparation for lifelong learning.*
For Kotter (1996), what makes the difference between the most successful graduates and the rest is the ability and willingness to engage in lifelong learning. He illustrates the power of lifelong learning and compounded growth with a simple example:

> 'Between the age thirty and fifty, Fran 'grows' at the rate of 6 percent – that is, every year she expands her career-relevant skills and knowledge by 6 per cent. Her twin sister, Janice, has exactly the same intelligence, skills and information at age thirty, but during the next twenty years she grows at only 1 per cent per year. Or maybe Fran has some experience that sets a fire underneath her. The question here is, how much difference will this relatively small learning difference make by age fifty. … For Fran and Janice the difference between a 6 percent and a 1 percent growth rate over twenty years is huge. If they each have 100 units of career-related ability at age thirty, twenty years later, Janice will have 122 units, while Fran will have 321. Peers at age thirty, the two will be in totally different leagues at age fifty.' (Kotter, 1996:181)

If the purpose of a university education is to equip students to lead a more successful life after graduation, however they define success, then preparing students for lifelong learning would seem to be the key ingredient.

*Accelerating change.*
The accelerating pace of change enhances the importance of developing students for lifelong learning in a number of ways. First, it shortens the shelf-life of subject knowledge acquired through a university education. The latest knowledge in a field of study is replaced more quickly by new knowledge as the rate of accumulation of new knowledge accelerates. Second, the faster that new knowledge accumulates the faster the accumulation of relative ignorance by those whose learning is slowest after university. Third, the faster that environments change, the faster must organisms adapt, and that applies equally to humans. Change alters the environments in which organisations operate. The key to surviving and thriving in a changing environment is adaptation and the ability to adapt depends on learning. Organisms which cannot adapt to significant changes in their environments die out. This applies to organisations too. Organisations that cannot learn how to adapt to a changing world are replaced by those that are able to learn how to do so (Toffler, 1985). The same principle applies to graduates. If we can predict an increasing rate of

change but we cannot predict the nature of that change, then the best we can do to prepare graduates for their lives after graduation is to prepare them so that they can thrive in a world of accelerating change. That means developing their powers of learning, and research is one way of learning. Many people have made the link between environmental change and the ability to learn. For example: '(1) When the rate of change is faster than that of learning, the organism fails. (2) When the rate of learning is as fast as (or faster than) that of change, the organism is likely to adapt, to survive and even grow.' (Revans, 1984,:30). The faster the required rate of change, the faster the required rate of learning after university.

For all these reasons, preparing students to plan and manage their own learning is an increasingly important part of a university education. We have argued that universities recognise this, to a greater or lesser degree, by reducing the amount of support and direction that students receive as they proceed through the years of an undergraduate degree. As one moves up the education ladder there is a steady increase in the amount of self-direction of student learning. We have also argued that this part of a university education is becoming increasingly important with the accelerating pace of change in the world, particularly in the knowledge-based sectors in which graduates are most likely to be employed. University education also needs to adapt in the face of the accelerating pace of change. How can a university education place more emphasis on developing the capacity of students to plan and manage their acquisition of new knowledge themselves?

It seems reasonable to conclude that treating research as a transferable skill in university education, culminating in a final year small-scale research project, would enable university education to place more weight on developing students' capacity to plan and manage their own learning.

**Discussion**

In this section we address a number of assumptions that have been made in this paper.: the assumption that the world is changing at an accelerating pace; the assumption that learning to learn can be enhanced by developing research skills; and the assumption that research skills are transferable.
In this section we also look more closely at the nature of transferable skills in HE.

*The assumption that the world is changing at an accelerating pace.* This paper is predicated upon the assumption that the accumulation of

knowledge is accelerating and that it is fuelling an accelerating rate of change in society (technologically, economically, socially etc). This begs the question of whether this is just conventional wisdom or whether it is a belief that can survive close scrutiny? There is not space here to assemble the large volume of evidence that underpins this belief (see, for example, Kurzweil, 2006) so here is a selection of just three pieces of evidence.

First, the number of academic journals that publish new knowledge is rising at an accelerating rate. The traditional role of the academic journal is to provide a means of adding to the stock of public knowledge ie the pool of knowledge from which all can draw. In 1665 there was only one scientific journal published in the whole world, *The Philosophical Transactions of the Royal Society*. Two hundred years later, in 1865, there were already over a thousand journals. And one hundred years after that, in 1965, the number had risen to one hundred thousand. The rate of growth is clearly accelerating … especially now that the Internet has 'kicked in' with on-line journals.

Second, the number of universities is growing at an accelerating rate. This is relevant because an important (and some would argue the *most* important) task of a university is the advancement of knowledge including the accumulation of new knowledge.

Third, practical knowledge is accumulating at an increasing rate outside of the universities. A good measure of the growth of practical knowledge is the number of patents granted. Most patents are granted to organizations and people outside of the university sector. An increase in the number of patents granted is a plausible index of growth of practical knowledge produced outside of the universities, and the number of patents granted worldwide is growing at an increasing rate (Strauss, 2008).

These data, moreover, understate the growth in practical knowledge ie the sort of knowledge that fuels change (Ridley, 2010). Most of our growing knowledge about the internet, for example, has not been recorded in academic journals or patented, including, for example, the crucial contribution to the development of the web by Tim Berners-Lee (Naughton, 2000).

In other words, the contention that accelerating accumulation of knowledge is fueling accelerating change may be conventional wisdom, it

may even be a platitude, but that is only because it is correct.

*The assumption that learning to learn can be enhanced by developing research skills.* Learning processes can be arranged on a spectrum depending on how systematic and self-aware they are as means of increasing knowledge. At one end of the spectrum is incidental learning (Davies, 2008) where learning is an unplanned by-product of experience. Further along the spectrum there is learning which is planned and managed by another, usually a teacher. Yet further along the spectrum is independent learning, where the learner sets the intended learning outcomes and develops strategies for realising them. We assert that planning and managing a small-scale research project lies on this spectrum and even further along it.

To test this assertion it is first necessary to look at the relationship between learning and research. Research is the intentional creation of shared new knowledge. It is a major tributary into the pool of shared knowledge. Planned learning is the intentional creation of new *personal* knowledge. It is a major tributary into the pool of personal knowledge. Every act of research starts with an act of learning. The findings of a researcher first add to the researcher's pool of their *own* knowledge. It is only when he or she disseminates the findings that they also add to the pool of shared knowledge.

It is clear, therefore, that all research involves learning but not all learning involves research. So research is one form of learning and thereby occupies a place on the spectrum of learning processes. It is reasonable to conclude, therefore, that the student's repertoire of ways of knowing can be enhanced by developing their research skills. In other words, teaching students to plan and manage a research project can enhance their ability to learn how to learn.

*The assumption that research skills are transferable.* Research in physics is very different from research in anthropology which is very different from research in fine art, and so on. If research is so different across academic subjects then how can it possibly be transferable to the various facets of the lives of students after they have graduated?

The content of research varies across academic subjects and contexts and so do many of the specific activities involved. However, at a higher

level there is an underlying unity in the process involved. All research projects have to be planned and managed, so developing the ability to plan and manage a research project develops students abilities for living in the complicated world of the 21st century. Planning requires the development of the sort of thinking necessary for realising desired outcomes ie strategic thinking, which is a skill needed in many forms of graduate employment and in life more generally. Managing a small-scale research project not only requires skills of project management but also skills of self-management. Whatever students do after graduation, they will be using their selves as the instruments of their agency. For this reason, a student's skills of self-management may be the most important and transferable skill of all.

The unity of the research process, however, goes further as nearly all research projects involve to a greater or lesser extent four stages: (1) Reviewing the field ie discovering what is known already about the issue in question; (2) theory building, ie formulating or reformulating ideas about the issue in question; (3) theory-testing, activity intended to see if those ideas hold water; and (4) integrating what has been found in this research project with what was already known about the subject (Bourner, 1996). These stages in the research process are also applicable to nearly all planned learning projects. The development of skills that support each of the stages is clearly of value to graduates involved in any form of organisational research and this implies significant transferability. We contend that this transferability goes yet further; these skills are valuable in the major decisions that graduates will also face outside of their lives as employees. They are significant assets, for example, in deciding where to live, which home to rent or buy, which car to buy, which personal computer, which mobile phone etc. The applicability of research skills to nearly all of life's major decisions implies a very high level of transferability.

In summary, conducting a research project involves a range of skills that are widely transferable. These include problem formulation, discovering what is already known about the issue, creative thinking, strategic thinking and critical thinking, project planning, project management, self-management and integrating knowledge from different sources. These are all high level skills of wide applicability.

*Transferable skills in HE.*

Transferable skills are skills that can be used for many different purposes and in many different contexts. Transferable skills in HE can be broadly

classified into study skills and skills for work-readiness. Some, such as ICT skills, fall into both categories.

Two important features about transferable skills are: (1) what counts as a 'transferable skill' changes over time, (2) there is an on-going debate about the extent to which transferable skills should be developed in school, in university or in employment. Arguably, study skills should be developed at school and employment skills should be developed at work and neither should be developed at university.

What counts as a transferable skill clearly varies in response to economic, social and technological changes. Thus ICT skills were not regarded as important in the 1950s but they are today. Should ICT skills be developed in school or university or in employment? A plausible case can be made for each.

It is instructive to look at the history of the skill that was regarded as the pre-eminent transferable skill during most of the history of the European university. That skill was fluency in *Latin*. Latin was the means by which educated people could communicate with each other for the first six hundred years of the European university. All the significant books were in Latin, including, most importantly, the Vulgate bible. Newton's Principia Mathematica was written in Latin in the second half of the 17th century the better to communicate with a readership of scholars. Until at least the 18th century only those people who could read and write Latin could reasonably call themselves scholars. Until that time, Latin was not an esoteric subject that enabled educated people to read the words of the Ancients in the original, it was a living, breathing, technical means of communication. If knowledge is power then Latin was the key to that power. It was the key to the power of the Church, Roman Law, all the professions, the academy and communicating with educated people across Europe. This is clear from Waquet's authoritative work on *Latin, the empire of the sign*:

> ‘Over the centuries it (Latin) had acquired real claims to universality by being the language of three great powers, political, religious and intellectual, which had ruled over immense territories: the Roman Empire, the Church, the Republic of Letters.’ (Waquet, 2001:258)

During most of the centuries in which proficiency in reading and writing Latin was the dominant transferable skill there was a debate about whether

it should be taught in schools or in universities. In medieval times, when more people would enter university at a young age, the early teens, there was a strong case for teaching it in the university (as part of the trivium). Later, as the age at which most students entered university rose to the late teens, the case for teaching Latin in schools grew stronger and it became prerequisite for a university education.

Later still, as vernacular languages grew stronger in European countries the question whether to publish in Latin or in the vernacular turned on whether it was more important to communicate with the international community of scholars or with the people of one's own country. As commercial companies came to dominate the processes of printing and publishing, financial considerations came to exercise a decisive influence. Since the international community of scholars was small relative to the population of whole European countries the balance gradually shifted in favour of the latter. Thus a combination of technological change (in printing) and economic change (in publishing) gradually reduced the value of Latin proficiency as a transferable skill.

The changing fortunes of Latin illustrate the two central features of transferable skills in the HE curriculum: change over time in what is valued as a transferable skill, and the question of whether any given transferable skills should be developed at school, university or in employment.

On both of these issues the balance will change over time in the light of technological, economic and social changes. For example, a successful policy of increasing access to higher education will increase the heterogeneity of the student body. This makes it more difficult for universities to require that school leavers have specific study skills as pre-requisite for entry. The smaller the percentage of university entrants who are school leavers the more will universities have to accept the role of developing study skills. Also, the higher the percentage of graduates who experience difficulty in finding 'graduate jobs' on leaving university, the stronger is the case of developing skills for work-readiness within the university rather than in employment itself.

The most that can be predicted about the role of transferable skills in the HE curriculum is that the same two factors will continue to apply. The best location for the development of study skills will continue to shift between school, university and work in response to changes inside and

outside HE. And what is valued as a transferable skill will continue to change over time. The attempt to pin down, once and for all, the transferable skills that should be developed in a university is doomed to failure. Five hundred years ago it was inconceivable that Latin would be toppled as the main transferable skill in HE. Nowadays it seems strange to refer to Latin as a transferable skill at all.

There has existed a tension in HE between transferable skills and research-led teaching; the former has been associated with HE that is student-centred and vocational and the latter associated with HE that is subject-centred and academic. This tension has been felt particularly in those further education (FE) colleges offering degree-level courses, so-called college-based higher education (CBHE), with traditions and commitment to vocationalism and aspirations towards HE:

> 'Furthermore, and while recognising the importance of the skills agenda for CBHE, we should not allow it to undermine the essence of what the word 'higher' means in higher education. Some key characteristics of which are that students need to be increasingly made aware of the contested nature of knowledge; the conditions under which knowledge is discovered and manufactured; and in general that HE is as much concerned with what is *not* known, as what *is* known. … we should not allow ourselves to become unbalanced once again by concentrating on an equally misguided notion of vocational relevance, which ignores the epistemological essence of HE (Lea and Simmons 2012).' (Healey, Jenkins and Lea, 2014, p. 14)

In this paper we have offered a rationale for research training within the undergraduate curriculum that integrates research training *within* the skills agenda rather than being a countervailing force. The case for including research training as a transferable skill within the undergraduate curriculum will only become stronger as the pace of change accelerates.

*Undergraduate research and the tripartite mission*

This paper has been written from a student-centred perspective; it has looked at the development of student research skills in terms of preparation for life after graduation. To what extent does undergraduate research also support the other two parts of the tripartite mission: the advancement of knowledge and advancement wider society, including the local community?

The development of student research skills at the undergraduate level clearly supports the advancement of knowledge. It does so in three main ways: (1) it develops the capacity of students to create new knowledge after graduation, (2) it prepares them for further training in research at postgraduate levels and (3) a small research project planned and managed by a student can contribute directly to the accumulation of knowledge. The internet offers increasing on–line opportunities for communicating the findings of such research. Moreover, the emergence of undergraduate research journals has extended opportunities available for students to share their research results. The US Council on Undergraduate Research lists many such journals, including, for example, *Berkeley Undergraduate Journal*, the *Caltech Undergraduate Research Journal* and the *Columbia Undergraduate Science Journal*.

Does the development of undergraduate research also support the 'third leg' of the tripartite mission and benefit the wider society, including the local community? It does, by enabling undergraduates to contribute to the pool of knowledge available to those outside the walls of the university, by developing students into graduates who are better able to contribute to such a pool of knowledge and by providing a vehicle for service learning and student engagement with the local community. The scope for such research is underlined by the establishment of a journal in 2012 by Penn State University titled the *Undergraduate Journal of Service Learning & Community-Based Research*. This could be a significant development for HE.

The conclusion of this section is that undergraduate research is a valuable addition to the higher education offered by a *fully-functioning* university (Bourner, et al., 2013).

**Conclusion**

The aim of this paper was to explore the place of research training in HE in the 21st century. In view of the apparent filtering down of research from PhD, through Masters level into undergraduate programmes our focus has been on undergraduate research. The main results have been:

(1) conceptualisation of research as a transferable skill, thereby allying undergraduate research with the skills agenda in HE, rather than as a countervailing force,

(2) the development of a student-centred rationale for undergraduate research which complements more discipline-centred arguments.

Our emphasis has been on ways in which undergraduate research serves the advancement of the student and, in particular, its contribution to the preparation of students for life after graduation.

(3) the contextualisation of undergraduate research in terms of a more general phenomenon of 'filtering down', which applies to both the content and methods of higher education,

Some changes in HE are not the result of system-wide thinking but are the accumulation of a myriad of piecemeal choices. It would seem that the 'filtering down' of research training from PhDs through Masters programmes into undergraduate courses has been this kind of change. The phenomenon of 'filtering down' is more readily recognised in term of subject content. Most new knowledge appears first at the highest level - that of research - and then filters down in increasingly pre-digested form. Doctoral study aims to discover new knowledge. The reading lists of Masters' degrees are usually heavy with journal articles which report the latest findings in a field of study. As one moves down from the final year of an undergraduate degree through to the first year the appearance of journal articles on student reading lists become rarer. Instead intermediate textbooks appear and then, at first year level, introductory textbooks. Material that was once taught only at university eventually finds its way into the A-level curriculum. 'Filtering down' also occurs in the domain of teaching and learning methods. The university seminar originated at postgraduate level as a way of supporting the development of science researchers in 19th century German universities, and gradually spread to other subjects, other countries and lower levels of HE.

Research training has filtered down during the 20th century as a result of piecemeal decisions taken to realise the specific goals of particular courses. We need to re-evaluate the location of research training in university education in the 21st century. We have identified three powerful forces that are behind the filtering down process: the increasing need for graduates to be able to test ideas and evidence in a more knowledge-based world, changing priorities in preparing students for graduate employment and a growing requirement for students to be able to plan and manage their own learning. Each of these is affected by the acceleration in the pace of change in the world, driven by acceleration in the accumulation of knowledge. Since this is unlikely to abate, the three forces are unlikely to weaken and so the filtering down of research training is likely to continue throughout the 21st century. Our main conclusion is that it is time to

recognise that these piecemeal decisions reflect a growing case to bring research training into the undergraduate curriculum as a transferable skill with which *all* graduates should be equipped.

*Implications*

There are several implications of introducing research training as a transferable skill in to the undergraduate curriculum. The first concerns congestion in the undergraduate curriculum (Dalley *et al*, 2008). Making provision for research as a transferable skill on all undergraduate courses would imply additional demands on the capacity of most such courses. Something would have to give. Since the accelerating pace of change reduces the shelf-life of the latest knowledge in academic subjects, the obvious candidate for some contraction is subject knowledge itself. For the most part, this would probably mean a narrowing of the coverage of subject content within degree courses. This is consistent with what has been happening to university education for the last 200 years, since the emergence of the Humboldtian, or modern, university in the second decade of the 19th century. Until the 19th century there was little specialisation in university education. For the most part, the students at a university followed a largely common curriculum. Since that time, increasing academic specialisation, driven by the accumulation of new knowledge has been a dominant theme of university education.

A second implication is the need for systematic consideration and discussion of how best to develop research skills within the undergraduate curriculum. It seems reasonable that the end-point should be a final year unit in which students plan and manage a small-scale research project. Such an approach is already adopted in some undergraduate programmes but these are probably still a minority. We envisage a time when the ability to plan and manage a small-scale research project is the hall-mark of an undergraduate honours degree. This leaves open the question of what studies at intermediate and possibly introductory levels would best support that outcome. Happily, the spadework for resolving this issue has been undertaken by Healey and Jenkins (2009 and 2014). The US Council on Undergraduate Research also offers a wide range of resources to address the issue.

Thirdly, it would be necessary to think through the implications for Masters and Doctoral studies. If these courses could be sure that they were recruiting students who had all demonstrated the capacity to plan and manage a small-scale research project then it would be possible to take

these courses to a higher level as they would be building on a higher platform. It could, for example, involve a movement towards the award of a research degree by publication as the *normal* route to a PhD. This would emphasise the significance of *sharing* new knowledge as an important part of the research process and it would help eliminate the phenomenon of PhD students whose training in research never leads to any subsequent published research.

*Further work*

The starting point of this paper was an awareness that research training was filtering down from Doctoral to Masters and into some undergraduate programmes. Thanks to the work of the HE Academy and, in particular, Healey, Jenkins and Lea, and the Council on Undergraduate Research in the USA, we now have many case studies of undergraduate research. It would be valuable now to discover the scope and extent of this phenomenon, including, for example, the proportion of courses in different subject areas that include undergraduate research and different sectors of HE. To the best of our knowledge, the extent of 'filtering down' of research into the undergraduate curriculum is not known by subject, by sector or, indeed, across HE as a whole. To the best of our knowledge also, the last general survey that sought to quantify the incidence of different teaching and learning methods in British HE was the Hale Report for the University Grants Committee in 1964.

There would also be much merit in evaluating the experience of teaching research on what are otherwise taught courses. It was clear from the Harris Report (1996) that dissertations had become a normal part of Masters programmes by the end of the 20th century. It would be valuable to differentiate between those with research-based dissertations and others, to evaluate how successful this development has been. A study of good practice in teaching research skills on undergraduate courses, including obstacles and pitfalls, would enable filtering down to progress with as few hiccups, hitches and casualties as possible. Again the work of Healey and Jenkins for the HE Academy has laid the foundations for such an assessment.

In summary, it is apparent that research training has progressively filtered down from doctoral programmes through Masters programmes to undergraduate courses. We have argued that this process will not abate within the foreseeable future. The key question is whether this will continue in a piecemeal, stop-go and haphazard way or whether it will proceed mindfully on a system-wide basis with due consideration for reasons

underpinning it and how best to realise the benefits most fully.

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