

Learning Outcomes and Ways of Thinking across Contrasting Disciplines and Settings in Higher Education

NOEL ENTWISTLE
University of Edinburgh School of Education

ABSTRACT

This paper describes the ways in which learning outcomes have been, or will be, investigated within the TLRP projects in higher education. It introduces the term *ways of thinking and practising* which has been used in one of the projects to describe the intentions of staff in higher education. This term covers what staff see as the essential nature of their discipline and so defines learning outcomes more broadly than is typical in the current specification of *intended learning outcomes*. The paper considers the wide range of differences in learning outcomes that exist across higher education, reflecting different institutional missions and priorities, as well as the fundamental differences that exist between subject areas in the nature of learning outcomes, and considers some of the problems in how to conceptualise and assess them.

KEYWORDS

Higher education, intended learning outcomes, institutional differences, disciplinary cultures, ways of thinking and practising, subject area differences.

IDENTIFYING LEARNING OUTCOMES IN HIGHER EDUCATION

As Brown and James explained in their introductory article in this collection, the TLRP thematic group on learning outcomes tried to establish ways in which learning outcomes could be described and interpreted across all the stages of education represented by the programme. This analysis led, first, to a classification of the projects in terms of different kinds of learning outcome and then to an exploration of the use of the contrasting metaphors of 'acquisition' and 'participation' to understand the nature of the differences in the ways 'outcomes' have been conceptualised. This article is looking at the TLRP projects relating to higher education and will briefly indicate the learning outcomes being investigated in the five TLRP projects specifically concerned with teaching and learning in higher education in terms of the classification and the metaphors. It will then consider, more generally, the range of learning outcomes to be expected in higher education and the difficulty in comparing them before introducing, more specifically, provisional findings from the one project currently nearing completion. This project has been looking specifically at the wide disciplinary variations in the nature of the learning outcomes which students are expected to achieve.

THE TLRP PROJECTS IN HIGHER EDUCATION

There are five TLRP projects which are looking at teaching and learning in higher education. The directorships and titles of the projects included in this analysis are shown below, along with acronyms. Two of the projects were funded within Phase 2 of TLRP. The individual work of Newman concerned problem-based learning in nursing education and has been recently completed, with summaries available on the TLRP web site. The other Phase 2 project is due to be completed by the end of June, 2005, but already a series of working and published papers are available on the project web site. All the Phase 3 projects are still in their first year, and the analyses by the thematic group analysis had to rely just on the accepted proposals. Much more will be able to be added later on how learning outcomes have been treated in those projects, but rather little could be said on the basis of the material then available.

Phase 2

Newman	The effectiveness of problem-based learning in promoting evidence-based practice (PBL)
Hounsell/Entwistle	Enhancing teaching-learning environments in undergraduate courses (ETL)

Phase 3

Brennan	The social and organisational mediation of learning (SOMUL)
Fuller	Disabled students learning in higher education (DS)
Mills	Learning to perform: instrumentalists and instrumental teachers (L2P)

The detailed terms used by projects to describe their learning outcomes can be found on the TLRP website. Here, we shall simply indicate the general areas before examining some aspects of them in later sections. The first analyses carried out by the thematic group sought to group the learning outcomes within frameworks that identified the types of learners and learning outcomes on which each project was focusing. All the studies are looking at undergraduate students as either the sole or a main group of learners, but the L2P project goes further by investigating the learning of professional musicians beyond graduation, along with the activities of instrumental teachers. The ETL project is also concerned with changes in the way staff look at the teaching-learning environments they provide.

At institutional and governmental level the term 'learning outcomes' is seen almost entirely in terms of whether the student has successfully completed a course of study- the grades and ultimately the level of degree awarded - but within TLRP a broader view has been adopted in some of the higher education projects. In terms of the classification into seven distinguishable categories, the most commonly found categories in the higher education projects were, not surprisingly, the attainments, understanding and higher-order skills shown by students, although dispositions and attitudes were also found. And, almost inevitably then, the dominant metaphor being used was found to be *acquisition*, although some projects also saw learning as involving *participation* and others in the *mixed* category. As we shall see, however, general statements about the balance between acquisition and participation are likely to be misleading.

Looking now at the individual projects, Newman reviewed the literature on PBL and carried out a small-scale study comparing PBL with a more traditional approach, the main learning outcomes being the institutionally defined grades obtained by the students. The DS research team will also be relying heavily on grades as they identify and look at differences that may exist between the attainments of disabled students and other students. The other studies are also using grades as learning outcomes, but looking beyond them to consider the actual knowledge, skills, understandings, attitudes and values that are being developed within undergraduate and other courses.

The ETL project has been exploring the very different forms of conceptual understanding and higher order skills that staff in five contrasting subject areas expect their students to acquire. Its main concern, however, is the teaching-learning environments that are being used by staff to promote the required learning, and how those relate to the quality of learning shown by the students. As the TLRP programme focuses on improving both outcomes and engagement with learning, the ETL and DS projects are both also looking at contrasting approaches to learning, with the deep approach being used, in part, as a learning outcome which also serves as a proxy for levels of engagement. The SOMUL project is looking

at the cognitive development shown by students, but within a more sociological framework that also brings out different forms of identity – academic, professional and personal – and how these are mediated by different forms of social and organisational structures within institutions and between three contrasting subject areas. Finally, the L2P project will be investigating the professional development of musicians during their undergraduate programme, but also during their careers. This introduces an entirely different set of learning outcomes that will be considered later on.

There is clear overlap between the learning outcomes within the higher education projects and Eraut's TLRP project on 'Learning in post-graduate employment', which has identified additional forms of learning outcome. His project has developed the alternative category system, mentioned earlier in the contribution from Brown and James, which shifts the balance of categories from the academic to the professional. This framework introduces the judgement of priorities and of quality of outputs; task and role performance, including leadership, delegation, ethical issues and crisis management; and communication with others, as well as collaboration and teamwork. It also includes awareness and understanding relating to contexts, situations and other people; self-organisation, problems and risks; and priorities and values as well as strategic issues. In many professional higher education courses, such skills and competencies have also become recognised as learning outcomes in higher education, as students prepare for their future professional roles.

COMPARING INSTITUTIONAL DIFFERENCES IN LEARNING OUTCOMES

While government statistics report outputs from higher education in terms of progression rates and award of qualifications, it is becoming increasingly difficult to make meaningful comparisons between learning outcomes even within the same subject area and at the same level. Not only do UK universities and colleges have a wide range of differing missions, they also vary to some extent in the assessment procedures and marking criteria used, even within the same subject area. External examiners do moderate internal marks, but only within the guidelines and procedures laid out by the individual institution. The balance between course work and examinations also differs between institutions. Not only do these tend to assess differing qualities, course work almost always produces higher mean scores and less spread of marks than examinations. There is also difficulty and unevenness in the internal moderation of work marked by several different examiners. Even combining course work from different markers with examination grades creates problems, as sets of marks with a larger spread have more influence on the final rank order than those with narrower ranges of marks. For all these reasons, the only comparisons that can be made with confidence are between the relative attainments of students taking the same course and, within TLRP, this is what the PBL study did and the DS project will be doing.

Other TLRP projects, although also making use of grades as important indicators of learning outcomes are collecting a range of additional indicators of learning outcomes to relate to the teaching approaches being adopted. They are using self-ratings of the knowledge and skills that students believe they have acquired, as well as using inventory scales to supplement and broaden the formal assessments made by the institution.

DISCIPLINARY CULTURES AND STUDENT IDENTITIES

In the next section, we shall be looking at the differences that exist in the nature of the learning outcomes across some of the varying disciplinary and professional courses found in higher education. The reasons for the differences are partly self-evident in the contrasting content matter that students are coming to terms with, but it is also important to recognise the implications of the distinctive academic and professional cultures into which students are being inducted. C. P. Snow (1964) started a lengthy debate with his notion of the 'two cultures' and the 'gulf of mutual incomprehension' which he had experienced between his academic colleagues working in the arts and the sciences. Nowadays, the social influences on knowledge and learning are also being stressed, and there is a general acceptance that the concepts used to establish new knowledge are, in part, socially constructed, and also that the learning involved in higher education is itself social in nature.

The SOMUL project is beginning to explore this social dimension and will be mapping the ways in which students develop their professional identities, along with academic and personal identities. And this work will build on the work of Becher (1989) who tried to capture essential distinctions between academic 'tribes and territories'. He concluded that Snow had over-dramatised the cultural divide, and yet important differences remained. In a revised edition of this book, Becher and Trowler (2001) explain how disciplinary specialists have been forced to collaborate in tackling real-life problems and so have begun to break down the boundaries. Nevertheless, marked contrasts remain in both the ways of thinking and the academic communities that exist. The cognitive distinctions between 'hard' and 'soft' and 'pure' and applied' subject areas are well known, indicating the forms of measurement used and the tightness or otherwise of the research designs in the first case, and the source of problems for investigation in the other. But the notion of there being differences in the nature of the academic communities, although part of Snow's experience, has been discussed less.

Becher and Trowler believe these differences to be important in understanding disciplinary differences and use two metaphors to describe these social aspects – convergence/divergence and rural/urban. While it possible to apply these categories broadly to whole disciplines and professional areas, there are variations within sub-disciplines in their relative 'hardness' or 'softness', and different universities may emphasise applied elements of subjects to differing extents. In general, physics can be classified as hard, pure, convergent and urban; mechanical engineering is less hard, applied, divergent and mainly rural. Biology includes both hard and soft elements, is mainly pure, has both convergent and divergent elements, and is rural. While economics has hard and soft facets, it also has pure and applied aspects and is convergent, but rural. History is described as being soft, pure, convergent and rural. The differing epistemologies identified in this study indicate equivalent differences in ways of thinking, but questions were not asked about teaching or learning. It is here that the ongoing work within the TLRP projects are making a distinctive contribution.

Both SOMUL and ETL projects are both looking at academic disciplines as distinctive epistemological and academic cultures and at the ways in which staff seek to induct students into those cultures. SOMUL is looking, in particular, at the academic and professional identities that students develop, but also at personal identity which "extends the notion of learning outcomes to areas such as attitudes, values, confidence, personal autonomy, self-esteem and moral development" (Brennan, 2002). His team will also be looking specifically at the effects of course organisation and institutional contexts on the development of this wide range of learning outcomes, while the ETL researchers are describing the learning outcomes that staff in five contrasting subject areas believe to be most important for them in their teaching.

ADDITIONAL WAYS OF CONCEPTUALISING LEARNING OUTCOMES

Quality assurance procedures in higher education have sought to rationalise the ways in which learning outcomes are described. As Oates and James argued in their contribution to this collection, these procedures have followed the earlier tradition of behavioural objectives in breaking down knowledge, skills and understandings into statements which make clear to students what is going to be rewarded in the assessment tasks. While clarity about outcomes is essential, formal statements of intended learning outcomes may fail to communicate the essence of the individual disciplines and professional areas, which depends on a holistic view of the knowledge and values involved.

The ETL project has been asking university teachers to describe what they are trying to achieve with their students. Staff often referred initially to the intended learning outcomes, but sometimes with criticisms of their restrictive nature which were similar to those made recently by Hussey and Smith (2003). Staff were then asked to explain in their own words what was important to them as teachers. Some mentioned detailed knowledge, conceptual understanding, or a variety of technical and/or professional skills, but most saw themselves as passing on to their students a distinctive way of thinking, such as that recognised in an earlier study by an economics lecturer.

More recently I've come round to the view that economists have acquired a way of looking at the world which is indelible, and even though they may not find themselves in a position where they can use their analytical techniques very consciously, in fact their whole way of treating questions is affected by this kind of training
(Entwistle, 1997, p. 4).

The main focus of the ETL project is on encouraging high-quality learning among university students. Much of the earlier research into student learning had seen high quality learning in terms of the deep approach that leads to conceptual understanding, but the interviews with lecturers made it clear that there were other important components of aspect of high quality learning. Looking across the range of responses from staff in five contrasting subject areas, the ETL research team saw a common aim.

The ETL team coined the phrase ‘ways of thinking and practising’ in a subject area (WTP) to describe the richness, depth and breadth of what students might learn through engagement with a given subject area in a specific context. This might include, for example, coming to terms with particular understandings, forms of discourse, values or ways of acting which are regarded as central to graduate-level mastery of a discipline or subject area... WTP can potentially encompass anything that students learn which helps them to develop a sense of what it might mean to be part of a particular disciplinary community, whether or not they intend to join a given community in the future, for example, by pursuing a particular profession.

(McCune & Hounsell, in press).

University teachers try to induct students into these characteristic ways of thinking and practising in the subject, initially through teaching and learning activities that see learning as the acquisition of individual knowledge, understanding and skills. Only in the later stages of an Honours degree do class sizes and the stage of academic development reached allow realistic participation with a community of scholars or professionals, although earlier involvement was found in discursive and contested areas, like history and media studies, as we shall see.

Other ways of conceptualising learning outcomes have also been explored in the ETL project, seeing them from the student perspective. For example, it has proved useful to think in terms of *troublesome knowledge* (Perkins, 1999). Some ideas, techniques and concepts seem to create blockages for students that inhibit academic progress. Of course, there will be difficulties attributable to differences between students in their stage of intellectual development, profile of abilities, and prior knowledge, but in certain subject areas we have found evidence of what have come to be called threshold concepts (Meyer & Land, 2003). Such concepts are often found to be too abstract or counter-intuitive to be readily understood, but once they are grasped they have a powerful influence on subsequent progress by opening up the subject in important ways. The effect is comparable to the transition from dualism to relativism in student thinking that was described by Perry (1970), without which students found it difficult to progress in their academic work.

A threshold concept can be considered as akin to a portal, opening up a new and previously inaccessible way of thinking about something. It represents a transformed way of understanding, or interpreting, or viewing something without which the learner cannot progress. As a consequence of comprehending a threshold concept there may thus be a transformed internal view of subject matter, subject landscape, or even world view.

(Meyer & Land, 2003, p. 1)

For example, if opportunity cost is ‘accepted’ by students as a valid way of interpreting the world, it fundamentally changes their way of thinking about their own choices, as well as serving as a tool to interpret the choices made by others.

One of the consequences of troublesome knowledge, and a failure by some students to grasp key concepts, is that these students fall behind. But in economics, and more particularly in electronic engineering, there is evidence in student interviews of a more general phenomenon which Scheja (2002) has described as *delayed understanding*. Of course, some delay between meeting a new idea and understanding it can be found in all disciplines, but in some subject areas the delay seems to be surprisingly long and to have marked effects on students’ progress. In Scheja’s study there was a mismatch between the pace set in the lectures and the students’ ability to cope with new ideas being introduced, which left students using a variety of coping ploys to deal with their difficulties. And in the ETL project the severity of the delay, at least in the early stages of analogue electronics, led to learning outcomes well below the required levels in between a third and a half of the students. As one student commented:

In second year I got a better understanding of what I learnt in first year. Now in third year I've kind of learnt what I was supposed to know in second year. It's a shame that I've never felt that I've learned it in the actual year [it was taught]... When you're being taught something, you're just desperately trying to learn it, and there's not necessarily a whole lot of interest. You're scrambling back to notes [in preparing for the exams], trying to understand the course. [But] at some point during the learning process, you do get interested and [then] things start to fall into place.

(Entwistle et al., in press).

Students' understanding cannot, of course, be seen just as the responsibility of the individual student. Far from it; the general level of learning outcomes depends crucially on the teaching the class has experienced. Nevertheless, any unusually long delay in understanding may also depend, to some extent at least, on the nature of what is being learned, and again this brings us back to the distinctiveness of disciplines.

SUBJECT AREA DIFFERENCES IN LEARNING OUTCOMES

Here, it is only possible to provide a flavour of the differences that are emerging in the ETL project by the focus on WTPs in five subject areas, and offer some indication of what the L2P music project will be considering.

Biological science

Biology requires students to acquire a thorough understanding of a large number of clearly defined concepts, many of which are abstract and potentially difficult to grasp. In biology, high quality learning involves many different forms of knowledge and understanding and a range of subject specific skills and practices, but central to these is the need to be able to use different research methods effectively. More generally, students are required to develop a critical understanding of the collection and use of information and data, and the relationship between findings and theoretical frameworks, while recognising that much of what they are taught is provisional, due to continuing scientific advances. Staff stressed the importance of 'interconnective and synoptic understanding' – where students try to grasp patterns of relationships or to take a broad holistic view of the subject – and 'epistemic understanding' – where students begin to understand the nature and origins of knowledge in the biosciences (Hounsell & McCune, in press).

Final year students are expected to cope with a 'step-change' in their ways of thinking as they face up the importance of scientific method and the types of reasoning used to interpret evidence and develop a synoptic view. They have to master the types of critical thinking about evidence which will be expected of them in professional work in the field, but they were still finding the primary literature difficult to handle. In group interviews, students explained some of the ways of thinking they were struggling to acquire.

So, when we are reading [scientific articles] we don't have to say, 'Oh yeah, okay, these are the conclusions, yeah cool.' But we have to say, 'Why did they do these experiments, why not others? Okay, why is this working this way, why these conclusions?' [...] We have to prove that we are understanding the concepts... And studying [this area] there's lot of disagreement, you know they're not all saying the same thing or coming from the same line of thought. So they have different opinions... Nothing is ever clear-cut

(Hounsell & McCune, in press).

Where students heard biological researchers talking about their current work and were encouraged to question and discuss, and also in the experiences of placement, they were beginning to experience the *legitimate peripheral participation* which Lave and Wenger (1999) believe to be so important in learning more generally.

Placement] is the best thing I could have done for my degree. If had stayed on and rushed on just on fourth year [...] I'd be like, "Oh, here are the facts that we've been given", but I wouldn't have a clue about how people went around doing it [...] You've gone up a level [because of the placement], you're not a student anymore... It's much more real [on placement]. It's a different world completely... Real science isn't really about learning, it's about finding; it's about trial and error, discovery sort of thing, whereas being at university is about learning...

(Hounsell & McCune, in press)

Economics

Economics also demands a grasp of concepts and a particular way of approaching problems. WTPs in economics centred on the way in which theories and models helped to make sense of the real world with economic thinking seen as logical and analytic in abstracting the key elements of a problem and bringing appropriate concepts and research findings to bear in developing solutions. Lecturers were asked what the most important learning outcomes were for them, and one of them identified, for example:

An ability to work through and understand an economic model, to apply that model, to understand what the role of empirical evidence is in economics and at a relatively low level to interpret empirical evidence in the context of macroeconomics

(Reimann. In press)

As we have seen, economics was where threshold concepts seemed to be particularly important and represented significant learning outcomes in their own right. Staff accepted that a failure to grasp their meaning could create a substantial block to subsequent progress and is presumably one source of the delayed understanding mentioned by students.

Econometrics represented the dominant theoretical paradigm that students met in the course settings investigated, and this perspective treats the subject as being essentially scientific. There were staff, however, working from a more sociological perspective, who described WTPs, concepts and theories that conflicted with this mainstream view. Students would thus have to try to understand both the alternative frameworks and the reasons for them, as one of the lecturers explained.

It's very controversial, there's a lot of disagreement amongst economists and I think that's essential to show people that knowledge is not something that's fixed and stable, it's something that's evolving all the time... I start by saying what is the nature of knowledge basically, it's open ended,... it's the product of the debate between different people and different ideas and different perceptions... But what raps it up for me, and I touch upon this all through the years of lectures, is that knowledge is not something that is fixed and stable and there it is in the book

(Reimann, in press).

Electronic engineering

The main WTPs described in electronic engineering focused on the analysis and design of circuits. Students have to be able to grasp the function and mode of operation of a wide variety of different circuits before they begin to feel confident about their understanding. They also have to develop analytic skills, as complex circuits have to be analysed to understand how different parts of the circuit operate in contributing to the output of the whole. These analyses are made possible by simplifying transformations which then allow equations to be solved algebraically to determine the circuit outputs. Previous research suggested that one of the specific difficulties students encounter in electronics is that they are faced by contrasting representations or models of a circuit – the actual circuit, the circuit diagram, simplifying transforms of it, algebraic solutions, and computer simulations (Entwistle *et al.*, 1979). Students have to move between these different representations in solving problems or designing circuits. They also need to understand the function of a circuit in both practical and theoretical ways – the engineering applications and the physics of how it behaves.

In analogue electronics – a particular focus for the ETL project - one additional difficulty seems to be that understanding involves both analytic skills and an 'intuitive' grasp of circuit characteristics - intuitive in the sense that the characteristics of analogue circuits are less transparent and predictable than digital ones. One of the students said that

[Analogue] requires a different kind of mindset than digital, which seems to be more to do with computer science. For analogue, I think it is much more mathematical and analytical. Even just a little difference in a circuit can make a big difference to how it operates, so you have to realise that and go back to first principles and work out how it works again.

(Entwistle *et al.*, in press)

Students thus have to build up substantial experience of the properties of many different kinds of circuit before they can 'see' what lies behind any new circuit diagram they meet or can decide what type of circuit will be required in a design problem (Entwistle et al., in press). This may well account in part for the experience of 'delayed understanding' which was mentioned earlier as being prevalent in this subject area.

History

In both history and media studies, there is much more room for the personal interpretation of evidence than in the sciences and social sciences. Theory in these subject areas is essentially contested but there are fewer abstract concepts that could cause stumbling blocks for students. Most of the work involves students in interpreting texts and writing essays in which personal viewpoints are encouraged, as long as they are well-supported.

In the ETL project, the undergraduate history curriculum was found to show much greater variety between departments than, for example, in electronic engineering or economics, which were recognisably similar in the early stages of the degree. Nevertheless, there was a great similarity in the WTPs that were described. Above all, the aim was to help students to achieve a greater awareness of the contested nature of historical knowledge and of how evidence was used in argument (Anderson & Day, in press).

Students have often not experienced this level of uncertainty in knowledge in their previous educational experience, and so an important task in the early stages is to help them to break away from previous, more restricted, ways of thinking about the subject. They then begin to see history in a wider social and temporal context and to develop a perspective of the past that avoids the fallacy of 'presentism' – interpreting past events in terms of current understandings of authority and society. Although individual concepts did not seem to have the transformative property found in economics, this changed way of thinking did seem to act as a threshold for students' academic progression in history.

Being able to view matters from alternative perspectives was emphasised by staff as crucial, and can again be seen as part of Perry's development towards the acceptance of relativism. The project's History Subject Adviser suggested that such development could be seen as 'layering'

"in which students were helped to add new layers to their current understanding of a topic and over time by this means to build up a more sophisticated, differentiated picture of a particular area of history. Part of this progression was seen as gaining a greater maturity of judgement which would encompass the perspective-taking abilities... - a cumulative process of refining skills and developing capacities and understanding"

(Anderson & Day, in press)

Students were being encouraged to express their own views in discussion and feel part of a joint enterprise that allowed them to believe that their views and interpretations had value as they began to think 'like a historian'. It appeared that students were beginning to experience, at a relatively early stage in their degree course, the experience of 'legitimate peripheral participation' in the work of the professional historian, even though very few of them would ever become historians. And the writing of their own well-structured and well-supported narrative in describing, analysing and interpreting past events and their consequences was developing core skills in history by communicating ideas in academically acceptable forms of expression and argument.

Media studies

Work on media studies was carried out for only one year of the ETL study, due to staff changes, and the focus was limited to the cultural studies component. As in history, contextual understanding was important in this area, although mainly to do with current situations in differing cultures or sub-cultures. The WTPs mentioned by staff indicated that it was particularly important for students to be able to imagine what it is like to exist in other societies or under alternative social conditions. There were also some ideas that appeared to have the transformative effect of threshold concepts, even though the concepts themselves are less clear-cut than in economics. An example was provided by one of the tutors.

At the end of October we hit them with a training video from broadcasting organisations. It deals with how TV editors deal with images of violence [and] shows what the editors leave out on grounds of taste and decency... This is an intellectual shock to students, shocked because they think that seeing is believing, that the news protects them... Half of them become angry and half of them grateful to the broadcasters; this is the first time they question the role of the media.. - .the first fundamental understanding is to grasp that all is not what it seems to be.

(Cousin, in preparation).

The way this experience 'opened up the subject' and even altered the students 'world view' makes it a strong candidate for a threshold concept in cultural studies. It also became clear from interviews with staff and students that the inculcation of democratic values and tolerant attitudes was an essential aim in the curriculum. It was seen as a generalised intended learning outcome, expressed through the role adopted by the tutor and in the relationships being encouraged among the students, as much as through any specific curriculum content.

The tutor has the power because you have the knowledge, but when the personal is brought in either to connect to the actual teaching or in the sense that you are valuing the person... - something about them that you respect and like and they can feel that it doesn't matter if the teacher has power, on another dimension they know you respect, then the power thing doesn't have to be so off-putting.

Music

The L2P project is looking at the ways in which students and professionals develop their performance skills. Within higher education, aesthetic studies of all kinds describe learning outcomes in very different terms to other subject areas, with their stress on individual expression, products and performance. Musicians enter higher education with well-developed performance skills and related bodies of knowledge, and are then helped to broaden the cultural and epistemological base of that knowledge in higher education and beyond. Some parts of the learning involves the development of individual knowledge and performance skills through direct teaching, but the L2P project will also looking at the learning involved in acquiring professional roles. Here, the musicians are learning through participation as they experience for themselves the importance, as performers, of presenting themselves distinctively and communicating with audiences in ways that leave a positive impression, and so increase the likelihood of future employment. Musicians also may have to develop a portfolio of activities in their professional role, involving a move between very different genres and arenas, with very different kinds of skill in both of musical interpretation and presentation. Altogether, 'learning to perform' involves a set of learning outcomes very different from other subject areas, the investigation of which should add significantly to the overall picture of learning outcomes in higher education and continuing professional development.

CONCEPTUALISING AND INVESTIGATING LEARNING OUTCOMES

Ways of conceptualising learning outcomes within the TLRP higher education projects

In this review of learning outcomes in TLRP projects, the emphasis has clearly been on the individual acquisition metaphor rather than participation. But the metaphors themselves were identified in relation to the processes of learning, rather than the outcomes, and a participatory process can lead to the individual acquisition of knowledge or understanding, so it is not surprising that 'mixed' metaphors were also identified. It does seem, however, that there are certain kinds of outcome - those related to transferable skills and values, for example - where it is difficult to imagine them developing except through participation. What can also be seen from the TLRP higher education projects is that learning activities involving participation are more likely to be found in subject areas that depend on contested knowledge, and in the more advanced courses in other subject areas where class sizes are typically smaller, the students have a deeper knowledge of the subject, and the course content is more closely related to either research or professional activities.

Inevitably, this review has drawn heavily on the one project that is nearing completion and has been looking at learning outcomes across subject areas. The ETL project has introduced the idea of *ways of*

thinking and practising because these became clear in staff's descriptions of what they really wanted students to acquire in their course units. These learning outcomes seem to represent the broad *understanding aims* introduced to us by one of our International Consultants – David Perkins – and based on research carried out by the Project Zero team at Harvard (Wiske, 1998). And their work also suggests the importance of keeping those aims at the front of students' minds using *throughlines*, an idea that has proved useful for several of the departmental colleagues collaborating in the ETL project. Within the current context in British higher education, an emphasis on WTPs and 'throughlines' would help to counteract the fragmentation of subject area knowledge that can be created by the requirement to use of 'intended learning outcomes'. While WTPs, by their very nature, are more difficult to assess, limiting the assessed outcomes to more precisely defined outcomes, is potentially damaging to students' understanding of the subject itself. The broader understanding of the subject can be encouraged through more open-ended forms of assessment and through ensuring that students cover general or problem-based questions or assignments.

In some subject areas, great stress is laid on learning outcomes that involve the acquisition of technical concepts. Many such concepts can be readily acquired from the explanations and examples provided but, as we have seen, others create much more difficulty and yet are crucial in opening up the subject. These have been termed 'threshold concepts', and this notion can be extended to describe threshold ways of thinking found, for example, in history. Either of these forms of threshold can markedly change the intellectual landscape seen by the student.

Threshold concepts have, so far, been seen as applying to subject matter, but thresholds and qualitative changes in conceptions are also found in the way students think about knowledge itself, and about what is involved in both learning and studying. Perry (1970) described what he saw as distinct 'positions' or stages through which students progressed during their university years, and subject-specific forms of the transition from dualist to relativist thinking have been seen in contrasting first and final year students in the ETL project.

In previous research, equivalent changes have been found in how students view the learning process, as Säljö (1979) found. Again there was a threshold, after which students not only put more effort into achieving personal understanding, but also recognised the existence of different forms of learning, and the purposes for which these would most effective. The qualitative changes in studying that flow from changes in conceptions of learning can be observed in the relative balance between deep and surface approaches (Entwistle & Peterson, in press), and these are being investigated in several of the TLRP projects. In initial analyses within the ETL project, a deep approach, combined with monitoring studying and effort management, has been found to link with both perceptions of a supportive teaching-learning environment and self-ratings of improvement in knowledge and skills across all the subject areas being investigated (McCune, 2004).

Research methods within the higher education projects

In the early stages of the TLRP, the programme committee went to considerable lengths to emphasise the need to improve the quality of educational research, equated by some to the 'gold standard' of randomised control experiments. According to this view a difference in instructional method is the single remaining, uncontrolled independent variable and so can be confidently seen as the cause of any changes found in the dependent variable. In the physical sciences, identifying a single cause has proved to be an effective strategy in making scientific progress, but the belief that single causes can be isolated in the social sciences has held back progress. Even in medical science, although randomised trials of drugs have proved valuable, the failure to take account of the wide range of individual differences in the effects of the treatments, not to mention the interactions that frequently occur between drugs, has left the approach open to considerable criticism.

In teaching and learning, it would be helpful to be able to demonstrate strong single effects, but there is a long history of failing to show any specific methods that have any consistent or generalised effects. Learning outcomes in higher education, in particular, are affected by a complex web of influences, with student characteristics interacting with experiences of teaching-learning environments in ways which cannot be readily generalised across institutional and subject area settings (Biggs, 2003; Entwistle, 2004).

Some effects may be anticipated from previous research and professional experience, but they have to be interpreted in terms of a detailed knowledge of a specific context and subject area. It is thus not surprising to find that most of the TLRP projects in higher education have been designed to investigate variability across settings, and do so generally by capitalising on the combined strengths of differing qualitative and quantitative methods. Instead of the misleading simplicity of effect sizes, we find research methods of different kinds, each designed to be in line with accepted procedure, but each making a rather different contribution to the aims of the research. Neither single effects and single experiments can cope with what we already know about teaching and learning in real settings. Instead, we need to think how best to accumulate evidence from systematically varied settings, with that evidence being interpreted in relation to previous findings. Bringing together findings from disparate methods is, of course, very difficult, but has already been carried out successfully in, for example, developing a curriculum framework for *teaching for understanding* McCune, V. (2004) 'Promoting high-quality learning: perspectives from the ETL project'. UNIPED 27(2), in press in schools (Wiske, 1998) and in a variety of so-called *design experiments*, many of which are not 'experiments' at all (Burkhardt and Schoenfeld, 2003).

TLRP will be accumulating a range of studies which have operated along similar lines and may eventually be able describe an alternative 'gold standard' for research into teaching and learning, perhaps along the following lines. Within any one study, the different forms of evidence collected are interpreted, first, according to the conventions of the specific methodology, and then in combination with other forms of evidence similarly validated. These pieces of evidence are then combined in ways analogous to those used by barristers to weigh and inter-relate material in constructing a case through which they hope to demonstrate to a jury the balance of probability of a particular conclusion. The jury evaluating conclusions from research into teaching and learning, presented in this way, will not be just research peers, but also the practitioners and policy makers who will just the strength and plausibility of the conclusions reached. Effective teaching is more likely to be achieved by helping teachers to understand how to interpret research findings within their own context and circumstances, and so to identify the strongest influences on their own students. They will then be better able to think seriously about how their own practice can be enhanced in the light of the best research evidence currently available.

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