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# DEVELOPING MEANINGFUL LINKS BETWEEN HIGHER EDUCATION AND TRAINING

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*ABSTRACT: This paper examines ways in which inter-relationships between knowledge and skills can lead to important links between education and training to the considerable benefit of each. In particular it reviews the variety of ways in which the acquisition of knowledge (in the widest sense of the term) can contribute to the development of competences and conversely the variety of ways in which the development of a broad range of skills (including competences) can contribute to the acquisition of knowledge.*

*Key words:* knowledge, skills, competences, education, training

## 1. Introduction

The problems associated with separate academic and vocational tracks in post-compulsory education have been widely debated and were clearly set out in the report of the Institute for Public Policy Research (Finegold *et al.*, 1990). In particular, the report highlighted the problems that it perceived as deriving from a divided system of post-compulsory education, namely the narrowness and exclusiveness of the academic route and the insufficiency of high quality vocational alternatives. Its solution was to recommend a unified system of qualifications. Despite government rejection of such a solution – implicit in the White Paper, *Education and Training for the 21st Century* (DFE, 1991) – there has remained a strong concern to find ways of bridging the academic-vocational divide (Young, 1993).

Much interest has been expressed in the development of General National Vocational Qualifications (GNVQs) as an important mechanism for helping bridge that divide (Jessup, 1991a). Although GNVQs were originally designed to help develop the skills that underpin a range of National Vocational Qualifications (NVQs) within a broad occupational area (Jessup, 1991b), it was the

identification of a range of 'core skills' as an integral part of GNVQs that has proved to be of greatest interest. The skills identified as core skills include those of problem solving, communication, learning to learn, working with others, numeracy, information technology and competency in a modern foreign language. Most educators would accept that the development of such skills may contribute in a significant manner to both the education and training of an individual, and as such they provide an important link between the two.

However, this is not the only type of link that can be developed between education and training to the benefit of both. The aim of this paper is to reflect on ways in which connections between the development of knowledge and competence can provide further valuable links between the two areas.

The first type of link reviewed in this paper emerges from consideration of an obvious weakness with NVQs, namely the way in which, from the beginning, they deliberately focussed attention only on what students should be able to do in the place of work – by and large ignoring the relevance of knowledge, which was generally perceived as no more than a factor on which the development of competence depended. This approach seriously under-estimated the importance of knowledge, particularly with regard to the development of higher level NVQs. Accordingly, I will begin this paper by looking at a variety of *ways in which the acquisition of knowledge can contribute to the development of competences*. This has clear implications for trainers who need to consider the extent to which knowledge needs to be built into, or linked to, courses designed to meet NVQ requirements.

I will then go on to consider the converse of the above, namely *ways in which the development of a broad range of skills can contribute to the learning process*. In doing this I will seek to show how skills that bear close resemblance to 'competences' and 'core skills' are often developed within academic courses because of the way in which they contribute not only to the development of knowledge and understanding but to the learning process as a whole. Although the development of such skills is seen as important from a teaching point of view, the skills developed are often overlooked when it comes to identifying, and giving credit for, what has been learnt. In considering these skills, I will discuss how slight modification and development of the related courses can often provide students with the opportunity of gaining NVQ accreditation for some of the skills developed. This has clear implications for teachers who need to consider the extent to which skills developed within their courses might be further developed for NVQ accreditation purposes.

Because the extension of vocational courses to include the

acquisition of relevant knowledge and the extension of academic courses to include the development of related competences provide logical links between the academic and vocational areas, they inevitably blur the boundaries between the two. However, any such blurring of the boundaries must not be allowed to obfuscate the very different purposes of education and training. In my *concluding comments* therefore care is taken to place the purposes of education and training, and the links between them, clearly in perspective.

## 2. Ways in which the acquisition of knowledge can contribute to the development of competences

In the discussion that follows I shall use the term 'knowledge' in the broad sense used by philosophers in the past and not in the narrow sense used by educators to describe simply the recall of facts. However, the term still requires some clarification to ensure that the comments on the way in which knowledge may contribute to the development of competence are kept in perspective.

Not surprisingly, different researchers have identified a variety of different types of knowledge, reflecting the different perspectives from which it has been viewed. Bloom (1956), for example, identified six types of knowledge (or what was described as six types of 'cognitive learning'). These were respectively concerned with the recall of facts, the development of understanding, and the development of the abilities to apply, analyse, synthesise and evaluate information. The term 'knowledge', as I shall use it, incorporates the whole of the cognitive domain, whereas in education it has come to be used in a narrower sense to identify one type of knowledge within the domain, namely that concerned with the recall of facts.

Eraut (1990) identifies six different types of knowledge that have a major role to play in the development of competence: 'situational knowledge, knowledge of people, knowledge of practice, conceptual knowledge, process knowledge, and control knowledge'. The fact that knowledge is perceived in different ways by different researchers does not mean that one perception is right and all others are wrong. Each provides insights from a different perspective, each adding in general to our understanding of the concept. Indeed, is it worth noting that the categories identified by Bloom *et al.* may be superimposed on those identified by Eraut to provide a clearer analysis of the type of knowledge involved in a given situation.

Within this paper I will view knowledge from yet another perspective, focussing in on four quite distinct types, namely *knowledge that underpins competence, knowledge that is an integral part of competence,*

*knowledge that facilitates the transfer of competence*, and *knowledge that facilitates change*. My intention is to highlight ways in which knowledge may contribute to the development of competence, and in so doing to help trainers to determine for themselves ways in which knowledge might usefully be built into, or linked to, their courses. Although knowledge is seen as having an important part to play in the development of competence, it is important to keep *the role of knowledge in perspective*. This is achieved in the final part of this discussion by highlighting a number of other factors that have an important part to play in the development of competence.

### *Knowledge that underpins competence*

In identifying standards of performance, Industry Lead Bodies have generally placed prime emphasis on ultimate performance in the place of work, and this is reflected in their identification of needs through 'functional analysis' and in their specification of standards in the form of competency requirements. Although it was generally recognised by those such as Eraut (1990) and Wolf (1990) that knowledge has an important part to play in the development of competence, there seemed to be a fear that any specification of knowledge within statements of competence might risk knowledge being taught for its own sake and not as a means to an end.

With the passage of time this approach has become somewhat more relaxed, and a number of standards now include statements not only of performance requirements but also of underpinning knowledge that is required. (The National Occupational Standards for Working with Young Children and their Families, developed by the Care Sector Consortium, 1991, provides a good example of such an approach). Eraut's notion of different types of knowledge is useful in this context in reminding us that underpinning knowledge may include not only knowledge of concepts and processes, but also other kinds of knowledge such as knowledge of people and situations.

If individuals are to become competent they will clearly need to acquire any knowledge upon which such competence depends. However, we might go further and suggest that such required knowledge should be identified in statements of competence. The logic is simple. If insufficient attention is paid to the development of such knowledge, there is a clear risk that students will fail to develop the competence required. Conversely, where a student is assessed as not yet competent, the list of underpinning knowledge provides a further checklist to help in identifying what still needs to be done to achieve competence.

*Knowledge that is an integral part of competence*

As we move towards identifying and measuring higher levels of competence, there are good reasons for suggesting that knowledge may not only underpin competence but at times may need to be recognised as an integral part of it.

Take, for example, the case of a doctor in a surgery. Although the doctor might appear to be behaving in a competent manner, and may well prescribe correctly in a number of cases, whether he is competent or not will depend largely on whether he has the knowledge required to justify his actions. This suggests that we cannot assess the doctor's overall competence simply by observing what he does, but we must also determine whether he has the knowledge to justify what he does. The same point might be made with regard to a variety of professions. It follows that, where we perceive knowledge to be an integral part of competence, we should acknowledge this when developing statements of competence.

*Knowledge that facilitates the transfer of competence*

In developing competences it was hoped from the beginning that individuals would not only develop competences within specific contexts, but that it would be possible to transfer the competences acquired to other contexts within the same occupational area.

Such transfer may happen readily in very simple, closely related situations, but in most cases some further knowledge or skill will be needed to facilitate transfer. Consider, for example, the case of a secretary contemplating ordering a new word processor. Transferring her word processing skills from one machine to another will almost certainly depend on her acquiring some additional knowledge and skills, and the greater the differences between her old and new word processor, the greater the knowledge and skills that she will need to acquire.

If we wish to facilitate the transfer of a particular skill, we should first of all be quite clear about what is to be transferred. For example, let us imagine that we want to help students to transfer problem-solving skills they have developed in physics to biology which they are about to study. It is quite possible that the problem-solving skills required in biology will be different in a number of significant ways from those developed in physics. It is only after examining them more clearly that we will know what might be transferable from one situation to the other. Assuming that we can clearly identify what is to be transferred from one context to the other, students will still need to

develop a considerable degree of knowledge (and possibly some additional skills) before they can expect to transfer the identified skills to the new context.

What we are really describing here is a process of development rather than one of simple transfer. If we want to see skills that have been developed in one context transfer to another, then we must take into account the further knowledge and skills that may need to be acquired to make this possible. The use of the term 'transfer' to describe such a process can be quite misleading. As Oates (1992) indicates, '(the process) is quite different from the common sense notion of transfer, in that rather than being centred on the idea of transferring something (a skill) from an old situation to a new one, it gives the view that every situation involves changes or adaptation of our existing skills and constructs. The extent of that change and the way we manage that change thus determine the extent and the speed with which we can learn to perform in that new task/situation'.

### *Knowledge that facilitates change*

A problem that all employers have to cope with at some time is that of change. It is not sufficient for employees to be highly competent in particular areas if they are unwilling or unable to adapt to changing requirements. What is needed according to Dixon and Baltes (1986) is a notion of competence or expertise that will enable individuals to adapt to the changing demands of work and social life.

Related knowledge can do much to enable individuals to cope more easily with change. According to Fleming (1991), knowledge not only enables newly developed concepts to be extended beyond the initial context, but also provides individuals with a greater understanding of the circumstances under which the skills are developed and under which they might be used. For example, a highly skilled laboratory technician is more likely to be able to develop and change the techniques he or she uses if he or she has a good knowledge of the concepts, theories and principles underlying a variety of techniques, understands the advantages and disadvantages of each and why they have evolved as they have. Again, it is likely to facilitate change if such an individual has a good understanding of emerging theory and practice, and appreciates the limitations of present practice and the advantages to be gained from change.

Needless to say, not all technicians can be trained to this level to cope with change, but it is not difficult to contemplate a range of professions (medicine, engineering, the law and so on) where individuals not only require high levels of competence, but also the

deeper knowledge, understanding and skills to underpin these competences and to enable them to cope with change.

*The role of knowledge in perspective*

In focussing attention on the role that knowledge has to play in the development of competence there is no suggestion that this is the only factor that trainers need to consider. As Hodgkinson (1992) points out, practitioners not only need knowledge and skills to reflect on what they see and to draw rational conclusions, but they also need to recognise how their own values and beliefs – and those of others – might affect their conclusions. Likewise, Ashworth (1992) draws attention to the extent to which individuals need to engage in teamwork and the importance of developing team skills as well as personal competences to become effective practitioners. It follows that there is a complex set of inter-relationships to which trainers need to give careful consideration.

Having said this, it is clear that knowledge has an important role to play in the development of competence, and trainers need to think carefully about the importance of different types of knowledge to their students. The amount of knowledge required will depend on the ultimate aims of students and teachers. If a significant amount of knowledge is to be acquired as a part of the training process the institution concerned might consider awarding separate accreditation for the knowledge component acquired. Following this approach full credit may be given for the achievement of both knowledge and competence requirements without any major change being required in the NVQ system of accreditation.

## 3. Ways in which the development of a broad range of skills can contribute to the learning process

Skills that bear close resemblance to 'competences' and 'core skills' are often developed within academic courses as an integral part of the teaching process – sometimes because the skills in themselves are seen as important, sometimes because they are seen as helping students to develop a deeper knowledge and understanding of the subject concerned, and sometimes because the approach in itself is considered to be intrinsically motivating. Skills of numeracy, communication, working together with others, problem solving skills, and scientific and technological skills are simply some of the skills that might be developed in this way. All too often in the accreditation process, because of the emphasis placed on the development of subject-related

knowledge and skills, teachers lose sight of the importance of such skills and the extent to which they may have been developed within their courses. This is unfortunate since the skills developed are often important in their own right and worthy of separate accreditation.

In the paragraphs that follow we will take one of these groups of skills – namely that of problem solving – to gain some insight into *ways in which skills can contribute to the learning process*. We shall then consider the same group of skills to see how teaching strategies might be modified and developed with a view to *providing students with the opportunity of gaining NVQ accreditation for skills acquired.* Needless to say, many skills developed within academic courses cannot be related to existing 'competences or core skills', and as such cannot be considered for NVQ accreditation purposes. However, the skills developed may be just as important, and we will go on to reflect on the wider range of skills that might be developed in higher education, considering why it is important to identify such skills and how we might set about doing this. The intent in doing this is to place *the relevance of competences in perspective*.

*Ways in which skills can contribute to the learning process*

Let us consider three strategies often adopted within academic courses – namely *an experiential approach* to learning, *an experimental approach*, and a *project-based approach* – and take note of the different ways in which the skills developed within each might contribute to the learning process as a whole.

The *experiential approach* to learning is essentially a problem-solving approach. It has been described by Kolb (1984) in conjunction with others (Kolb and Fry, 1975) as a cyclical process passing through four stages, namely those of 'experiencing', 'reflecting', 'concluding' and 'testing'.

> In the first stage of the process (*experiencing*) we notice something unusual, something unexpected, something that we want to understand and explain.
> In the second stage (*reflecting*) we ask ourselves questions about what we have observed, and we consider possible explanations.
> In the third stage (*concluding*) we consider the various possible explanations, and decide that one in particular appears to be more plausible than the others.
> And in the final stage (*testing*) we move on to check out our conclusion or hypothesis through practical testing. The evidence gathered from such testing may support our hypothesis. If it does

not we need to repeat the cycle once more moving on to consider alternative hypotheses.

The experiential approach was specifically designed to link theory to practice in a manner that would be more likely to promote 'deep' rather than 'surface' learning (Newble and Clark, 1986). However, it is worth noting that such an approach also enables students to develop the type of problem-solving skills that are required by the 'reflective practitioner' (Chown and Last, 1993) and are worthy of recognition in their own right.

By *experimental approach* I refer to the type of work that is traditionally carried out in the laboratory in science and technology courses. Such work may be undertaken for a variety of reasons. From a knowledge point of view it might be undertaken:

> to provide a deeper understanding of concepts, principles and theories, particularly through the gathering of related evidence, and to develop an understanding of the scientific process – providing the essential link between theory and observation

while from a skills point of view it might be undertaken:

> to develop scientific skills (such as those of controlling variables, measuring, collecting and interpreting data), and
> to develop practical skills such as those of constructing equipment, manipulating delicate instruments and making accurate measurements

Thus, in common with the experiential approach, an experimental approach can provide an opportunity not only for the development of knowledge and understanding, but also for the development of a range of scientific skills including those of problem-solving.

The prime aims of *a project-based approach* are usually seen as being to help individuals to develop problem-solving skills and a capacity for independent work. Morgan (1984) reflects this view in describing three types of project: 'a project exercise', 'a project component' and 'project orientation'.

> In a *project exercise* (usually a small part of a course) students apply the knowledge and skills they have acquired to an academic issue in a subject area already familiar to them. The problem and the methodologies are usually defined leaving students with little say in either of these matters.
> In *a project component* (usually a significant part of a course), students

have a much greater freedom to choose the nature of their projects and the methodologies they use.

Within *a project orientation* approach (a complete commitment to a project-based approach) students are given the greatest possible freedom to identify the nature of the project, the methodologies that they will use, and the subjects that they will need to study to meet the requirements of the project.

Although a project-based approach is very much about developing problem-solving skills and a capacity for independent work, it may be used to develop any of the skills identified in discussing the experimental approach. It may also be used in group projects to help develop the interpersonal skills required in teamwork.

*Providing students with the opportunity of gaining NVQ accreditation for skills acquired*

Teachers following any one of the approaches described above might usefully consider to what extent their students are developing any of the competences or core skills for which NVQ accreditation is possible. In particular, they might consider the extent to which students are able to develop the 'core skills' of problem-solving (Figure 1) that have been identified by the National Council for Vocational Qualifications, and should have little difficulty in perceiving how their teaching might be developed to provide students with the possibility of obtaining a particular level of NVQ accreditation for the problem-solving skills that they have developed.

*The relevance of competences in perspective*

In considering how NVQ accreditation might be obtained for some of the skills developed within academic courses, there is no suggestion that we should limit ourselves to the use and development of those skills that can gain such accreditation. There are in fact many skills developed in higher education which have not been clearly identified or defined by academics, let alone by the National Council for Vocational Qualifications, and yet there are reasons for believing that many of these skills may be very important.

Arts graduates, for example, are often recruited not for their knowledge of a particular subject, but because they are perceived, rightly or wrongly, as having something special to offer above and beyond the knowledge of the subject studied. However, very little is known in practice about what this is, and herein lies an important challenge. Can we begin to identify what it is that graduates acquire

FIGURE 1: *The five levels of problem-solving identified by the National Council for Vocational Qualifications (1992)*

**Level 1**
Select standard solutions to fully-prescribed problems

**Level 2**
Use established procedures to clarify routine problems
Select standard solutions to routine problems

**Level 3**
Select procedures to clarify problems with a range of possible solutions
Identify alternative solutions and select solutions to problems

**Level 4**
Extend specialist knowledge in order to clarify complex problems with a range of possible solutions
Identify alternative solutions and select solutions to complex problems

**Level 5**
Extend specialist knowledge in order to clarify problems with a range of possible solutions which include unknown/unpredictable features

in terms of knowledge and skills that make them of such potential value in their subsequent careers, and in beginning to understand this better can we develop courses in a way that will enhance the attributes that they take with them into later life?

We have already reflected on the role that knowledge has to play in the development and transfer of skills from one context to another, but here our concern is with the nature of the skills and the extent to which they might be transferable. In our earlier discussion of the notion of transfer it was suggested that such transfer is likely to depend on the acquisition of further knowledge and skills, and that the greater the difference between the contexts the greater the knowledge and skills that will need to be acquired. However, the transfer of skills will also depend on the extent to which skills are tied to specific contexts. Those skills that are least context dependent would appear to be those that should transfer most readily. The CASE Project (Cognitive Acceleration through Science Education) provides an interesting example of such skills and the extent to which they may transferable. In their review of the project, Adey and Yates (1990) describe how 'thinking skills' were carefully defined and how instruction was carefully sequenced to develop those skills within a

science context. They also report on how the benefit of such skills was measurable across a wide range of subjects, including subjects as far removed as English and History.

The CASE Project highlights the importance of defining the skills that we are trying to develop within a particular context and then seeing to what extent, and under what conditions, they appear to be generalisable. It also suggests a logical way of developing and studying such skills. For example, beginning with our own subject areas (eg physics) we might usefully start by identifying and defining the type of skills that we perceive as important and that we try to develop within our own courses. We then might highlight those that appear to be potentially generalisable, providing researchers with the opportunity to undertake studies to determine the extent to which, and under what conditions, they can transfer to other subjects within the same discipline (eg to biology), to other disciplines (eg to social sciences), to related occupational areas (eg to electrical engineering), or to a wide range of occupational areas (eg to management). Such an approach would help us to not only identify important skills that are already being developed, but would also help us to understand how we might increase the transferability of such skills from one context to another. At the same time it might alert the National Council for Vocational Qualifications to a variety of core skills that need to be included within their standards.

## 4. Concluding comments

Within this paper I have highlighted ways in which the inter-relationships between knowledge and skills can lead to the development of logical links between education and training to the advantage of both. We have also noted that this is only one of a variety of links that might usefully be developed. The 'core skills' which are an integral part of GNVQs already provide such a link, and this is already leading to a blurring of the boundaries between education and training. However, as such blurring occurs it is important that we should not lose sight of the differences between education and training, for it is these differences that help us to keep the links clearly in perspective. Let us therefore reflect briefly on these differences using the example of NVQs and GNVQs to illustrate the point.

It is clear that the 'standards' and 'competences' (ie 'units and elements of competence') that have been identified by Industry Lead Bodies as the basis for NVQs are designed to meet the needs of industry, and developing individual competences to meet these needs is what *training* is all about. Individuals can clearly serve their own

needs by developing many of these competences, but it is important to recognise that a process designed to meet the needs of industry is unlikely to meet the totality of individual needs.

Meeting the totality of an individual's needs is what *education* is all about. Of course, individuals need to develop a wide range of skills to meet their occupational needs, but they also need to develop a broader range of knowledge and skills that will help them to meet their particular needs in life. For example, they need to learn how to learn and how to manage their own self-development. They need to develop an understanding of themselves, their environment, and the interplay between them. They need to understand the nature of society, the rights and advantages that we enjoy as members of society and the responsibilities that we must accept in return. Not least, they need to learn how to work together with others to the benefit of all concerned.

In considering links between education and training we need to keep these differences in mind. GNVQs, for example, were designed to meet the needs of industry, and although they may include core skills that can contribute to both the education and training of an individual, they are unlikely in themselves to meet the totality of an individual's educational needs. This is not to detract from the importance of GNVQs, but simply to keep them in perspective. Likewise, although the links between knowledge and skills might be perceived as important, they too need to be kept in perspective.

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