

Integrating conceptions of learning for advancing educational practices

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Introduction

I have argued elsewhere (Desforges, 2000b) that the core function of educational research is to make a contribution to the educational enterprise. Education is society's commitment to enhancing the human condition through capitalising on human potential for learning. There are many factors involved in such a mission. Better education entails better resourcing, creativity, will, energy and resourcefulness. Researchers must make their contribution by adding to the base of knowledge and understanding on which to advance professional practice. Contemporary research must take us beyond what is already known and understood about teaching and learning. And much is known as the review by Bransford and his colleagues has clearly established (Bransford et al, 1999). Research must also take us beyond best practice. We make little contribution unless we can say more and better than the best practitioners already achieve.

At one level our research finding should contribute to developments in educational action and technologies. At a more fundamental level our research should contribute to advances in thinking relevant to teaching and learning - thinking from which teachers can advance their own practices. When teachers are asked what they want from research, they ask first for practical ideas and working technologies. Education always hinges on what one 'does on Monday'. But teachers also ask for coherent conceptions of learning to feed their own thinking. Teachers ask for conceptions of learning that do not change with fashion or with a change in research team.

In responding to this request from teachers we must note the considerable diversity of conceptions of learning in use in current research. And, I suggest, we need to offer professional educators theories which best represent the most powerful conceptions of the rich potential of the human mind for learning. In this paper I offer a brief survey of current theories of learning and, noting their diversity, suggest ways in which they might be integrated to meet the needs of professional practitioners in education.

Theory in practice

So far I have used the terms 'theory' and 'conception' interchangeably. I shall continue to do so. Each term refers to a set of basic assumptions about learning and how it best proceeds. More fundamentally, there are, embedded in these propositions deeper assumptions about the nature of knowledge - about the structure of what is to be learned. I have examined some of the assumptions in theories of learning elsewhere (Desforges, 2000b). In this present work I intend simply to describe and comment on those ideas about learning which, implicitly or explicitly, seem to drive the thinking of workers in the field.

Common practice has its taken for granted assumptions about learning. Shepard (2000) has recently contrasted, in respect of educational assessment practices, dominant views of learning amongst teachers with those prevalent amongst researchers. Practice, she argues, is driven by essentially behaviouristic models of epistemology. Here it is assumed that learning involves the accumulation of atomised bits of knowledge, that learning is sequenced and hierarchical and that transfer is limited - entailing that each educational objective must be taught individually.

Others (e.g. Bruner, 1996; Bereiter and Scardamalia, 1996) have suggested that everyday practice amongst teachers and trainers is not dominated by anything so systematic as a behaviouristic conception of learning. Common practice, it is argued, is embedded in folk psychology which is constituted of those everyday, taken for granted assumptions about mind which are necessary for the successful negotiation of everyday life. With respect to teaching, training and learning, folk psychology regards knowledge as 'stuff'. This is a material object. We encourage students to 'know their 'stuff' and 'get a feel for their subject'. Mind is a vessel or warehouse into which knowledge should be stuffed. Learning is 'warehousing'. We speak of a 'well stocked mind'. Warehousing is best done systematically with a good system of inventory. Assessment is, effectively, inventorying.

This folk psychology view of learning is, by definition, widely held and deeply entrenched in its effect on practice. It is self fulfilling and has a limitless absorbency for countervailing views or metaphors. For example, associationism and constructivism can easily be read as views of 'stuff' and 'stuffing'. Folk psychology is strongly committed to the bell curve view of learning capability. The distribution of human attainment across a population is self evident and self evidently associated with the underlying variations in people's warehouse capacity. Folk psychology treats excellence, wisdom and creativity as special cases of giftedness, the gifts being from God or some other benevolence.

It is arguable whether current educational practice is dominated by behaviouristic assumptions or by folk psychology. What is less arguable is that either way, these are not rich conceptions of human mental potential. Additionally, the folk psychology of teaching, whatever its provenance, stands in contradiction on many counts to those theories commonly in use in research. It is to these I now turn.

Theories in research

Shepard (2000) contrasts the behaviouristic view, which she considers to dominate practice, with what she terms the 'composite constructivist' view taken to dominate current research. In this view knowledge is assumed to be constructed. Meaning making is central to learning. In the process of meaning making, a learner's existing knowledge base is the key, active mediator of experience. Shepard argues that there would need to be dramatic shifts in practice to bring it into line with modern cognitive theory which represents, in her view, a richer, more valid model of human intellectual potential. I want to avoid privileging 'composite constructivism' in this way. One reason for this is the influence of education research is unlikely to roll over folk theory in the way Shepard implies. Folk theory is, in effect, the 'alternative conceptions' field of cognition where powerful quotidian views are known to stand in contradiction to established theories (e.g. in science) and to impede the acquisition of establishment theory. Much has been established in the field of understanding what happens when folk theory meets establishment theory (Chinn and Brewer, 1993) and

what is known here is not promising news for educators. Rather than advocating the setting aside of folk theory, I would suggest we need to know a great deal more about it.

A second reason for not privileging 'composite constructivism' is that it is not the only way - and perhaps not the most useful way - of packaging modern cognitive theory. Before contrasting conceptions of learning used in research with those evident in practice. I offer a brief tour of some modern research theories. The tour is necessarily selective. In the selection I have not attended to modern forms of associationism nor with basic constructivism (as represented by Piagetian and neo-Piagetian theories of individual intellectual development). This is not because I consider these to be unimportant - they clearly are. The reasons for not presenting them here is because (a) the core assumptions are integral to some of the conceptions I will present and they get their treatment in this way and (b) they are very well known and certainly much more so than perhaps is the material I will present.

The conceptions of learning in research which are covered in what follows are embedded in the current work on:

- expert performance
- connectionism
- participation theory
- activity theory

Expert Performance

Experts illuminate the very best of human performance. They show us the cutting edge of attainment. Experts are constantly pushing back the taken for granted limits of human endeavour. Learning lessons from experts, large numbers of ordinary mortals perform at levels beyond that to be considered beyond their reach. Expertise has been extensively studied using a range of methods (survey, case study, experimental intervention) and across a wide number of fields including sports, the arts, academic disciplines, professions and working practices including: for example, typing and waiting at tables in restaurants. This work has been extensively reviewed in terms of methods, theories and findings (Ericsson, in press). Ericsson contrasts expert performance with everyday skill acquisition of the sort exhibited by learning to drive or learning to use a PC, or by amateur sports people. In this learning process there is a period of introductory 'messaging' with equipment, instruments or routines. This leads to the performer 'getting the idea' of what performance necessitates. A serviceable conceptual framework is constructed. This in turn is followed by a period of practice until a level of performance is achieved sufficient to most immediate needs. Within this limit of application, automaticity is achieved. This is done in something of the order of 50 hours of practice in use. In contrast to expert performance this 'sufficiency' level is mediocre and constitutes a plateau of arrested development.

The acquisition of expertise is characterised by an increasingly rapid performance. It is controlled and economical of effort. But it is by no means routine. On the contrary, expert performance is creative and flexible in the face of prevailing conditions. This level of performance is attained only after thousands of hours of practice spread over at least one decade. The practice in question has to be carefully managed. In the field it is termed 'deliberative practice' in recognition of the level of metacognition involved. Experts continuously set new goals for performance, design new sets of achievement and look for new and more productive ways of organising their action. There is deliberate planning for

flexibility against alterations in prevailing circumstances and a continuous thirst for new knowledge about equipment, and, where appropriate, about competitors, field conditions and the weather.

A great deal is known about the mediating mechanisms between performance and practice. The core mechanism is that of metacognitive management - the thoughtful, planful examination of all facets of current performance and expected improvements. Practice also plays a key role. The hard grind of practice is part of the price of expertise. A third, critical mediator is the performer's development of new and advanced cognitive representations of action. Advanced typists, for example, look further and further ahead of the text to be typed and then organise fingering routines with the economy of chunking.

Classically, the predominant theory in work on expertise, particularly where expert performance has been perceived to be skills based, has been behaviouristic. The dominant theory in modern work on expertise is constructivism. Ericsson's review has shown that important by-products of the development of expertise often involve the enhancement of musculature or skeletal growth or even growth in sections of the brain. This notwithstanding, the main driver of expert development is metacognitive activity in the management of deliberate practice.

A key finding from the research on expertise is that the lessons learned can be taught successfully to ordinary mortals with outstanding levels of success. So evident is the role of practice in expertise and so successfully have the lessons been applied that leading workers in the field challenge the utility of 'giftedness' as an explanatory factor in accounting for expert performance. In pedagogic terms it is argued that there is no need for mediocrity in anyone's performance. The commonly observed mediocrity is simply an unnecessary state of arrested development.

Connectionism

In classical learning theory, including associationism and constructivism, there is an implicit assumption that higher forms of mental life are rule based if not rule governed. Most theorising in the field of learning has been an attempt to discover these rules, to model them and to pass them on in educational settings. The assumption of the rule governed nature of higher intellectual life has been severely questioned.

Perhaps the most serious reservation about his assumption is the observation that if a system operated to a set of rules there is no way it could generate a higher-level rule that could advance the system. Higher level learning is thus rendered impossible. It has also been noted that systems for controlling complex mechanisms in nature do not seem to be hierarchically rule governed. Such tasks (e.g. the regulation of heart rate) are achieved through multiple, overlapping systems. Further concern related to the assumption of rule governed mental life arises from studies of attempts to model intellectual processes. The easiest things for humans to do (e.g. pattern recognition) are proving the most difficult to model. Research suggests that humans use mental models rather than rule based systems in problem solving and are likely to use untrustworthy heuristics, such as case studies rather than formal principles, in dealing with everyday statistical inferences.

None of these lines of argument proves that human thought and learning are not rule governed or rule based but it does raise doubts on the matter. Human cognition may be more makeshift

and inelegant than classical wisdom would lead us to expect. This observation opens the door to radical alternatives. In contemporary psychology, connectionism offers an exciting, well worked and tested alternative in these terms.

Connectionist theory rejects the long held notion that cognition is based on rules. It retains the basic assumptions that mind produces and operates on representations of the world. In connectionist terms, knowledge is a vast network of interconnected elements. All knowledge is in these connections.

From a connectionist point of view, perception plays a significant role in cognition. Rule based systems start with theorem proving and work towards perception. Connectionism reverses that. Connectionist models approximate rather than embody rationality and proceed on best-guess approaches rather than definitive rules. The expert/novice difference in connectionist terms perhaps captures the fundamental essence of this approach and in particular the position on the relationship between actual performance and the rules that are sometimes (and in connectionist terms, mistakenly) said to describe it. To use an example from Bereiter (1991), for a novice cook, performance is a poor approximation to the recipe, whilst for an expert cook, the recipe is a poor approximation to performance. The difference between novice and expert is thus qualitative but is not well described in terms of rules.

The connectionist position does not mean that rules of or for intellectual processing are bound for the educational bin. Rationality is highly prized in our society. Educational systems are, to a significant degree, based on the assumption that the purpose of schooling is to teach the rules of higher order intellectual life. Whilst pupils are taught rules the evidence is that they rarely practice them. Rules of intellect are used to justify rather than guide intellectual processes. Rationality is how we talk about mental life rather than how we conduct it.

The connectionist, organic view of mental life has a long history. In respect of its relevance to education, it was perhaps initially and certainly most famously promulgated by Rousseau who emphasised the organic quality of cognition and proposed models of learning more akin to biological growth than to technical design. In modern terms these views have been largely dismissed as romantic and unscientific. It could be that connectionism and the modules of perception being generated will provide a conceptual rationale and understanding for organic models of learning. It is too soon to say. A 'connectionist revolution' has hardly started.

Participation and activity theories of learning

I move now to consider two areas of theorising which take a social turn. These are 'participation theories' and 'activity theory'. The key proposition here is not merely that 'context' is influential in cognition. Rather, it is that cognition is inseparable from its social formation.

Most theories of learning take as their core metaphor, that learning involves the acquisition of 'something' whether this something is skill or knowledge or understanding. It is assumed that this acquisition can be abstracted from experience and is subsequently portable as the baggage of experience.

A competing contemporary view rejects this assumption and starts with the view that knowledge is embedded in and inseparable from practice. It is said that cognition is 'situated' in the discursive and non discursive practices of the community of workers engaged in that

cognition. In this view the acquisition of 'stuff' or 'knowledge' is not an issue. Rather, novices learn to participate in 'communities of practice' whether the community is of scientists or teachers or football fans. (For a review and analysis of acquisition theories and participation theories, see Sfard, 1998).

From the point of view of participation theories, learning is a process of enculturation into a community of practice. The novice is cast as an apprentice. Learning proceeds through discourse and takes the form of advanced practice. Expertise is distributed throughout the community. Transfer of learning from one setting to another is not an issue and is not expected. The workshop community defines the boundary of application.

There has been an extended and virulent debate contrasting 'acquisition' and 'participation' metaphors for learning (see Sfard, 1998 for a description and analysis of this debate). Before commenting on this however, I set out some of the main concepts involved in activity theory (Engestrom, et al, 1999). Here, the view is taken that development or learning is co-produced (i.e. produced in the interactions of many agents) in extended social settings.

Activity theory is an attempt to get rid of mono causal or mono level explanations of change or learning or development and to avoid the dualism's of thought/action; theory/practice; facts/values as prevalent in the field of learning theory. The basic tenet of knowledge as 'practical-critical activity' is redolent of Marxism but historical determinism is rejected. The challenge of activity theory is to understand change at the individual and collective level through conceptualising the co-evolution of social, material and technical factors. Analysis has to contend with the historical continuity of the social settings of action and activity together with the situated contingencies of practical activity to hand. Artefacts mediate activity. In a simple case, the activity of the beater at the hunt is mediated by the artefact of the drum. Knowledge is cast as artefactual, generated in and for activity.

In activity theory two basic processes operate continuously at all levels. These are 'internalisation', which encapsulates the reproduction of culture and, 'externalisation', which describes the transformations of culture through the creation of new artefacts (including knowledge). Understanding the dialectical relationships between continuity and change, reproduction and transformation is the key challenge to Activity Theory.

The attempt to understand learning and development at all levels (individual/setting/system) demands new methodologies which bridge the gap between conceptualisation and intervention and which incorporate historicity whilst at the same time accounting for the multiplicity and diversity of individual human action. In all this, the concept of 'artefactual mediation' is central, 'the artefact is to cultural evolution what the gene is to biological evolution' (Engestrom, 1999, p29).

All the participants in an activity setting are on a time-line; embedded in history and engaged in future orientated labour. Learning occurs potentially in the internal tensions and contradictions between the operation of mediating artefacts and that labour. The contradictions might be generated at the individual, societal or technological level.

Overview and Commentary

The very brief description of the theoretical positions set out above show the field of learning research to be rich in activity and, I think, potential. My concern however, is not to praise the field nor even do full justice to it. Rather, my objective is to consider the relevance of this work to educational research, that is to say, to research committed to the moral purposes of education. In some respects the theories briefly surveyed are very different one from another. Each has its distinct albeit blurred focus.

Folk psychology is, in important respects, a 'theory of everything' and at the same time, in its taken for granted way, a theory of nothing. It is however, a very powerful conceptual position mediating everyday practice. The theory of expertise focuses on individual action but privileges cognitive management as a key mediator. Connectionism has a sharp focus on the individual mind and its pattern imposing capacity. Participation theory focuses on the activity of communities of practice on the workshop scale and, to a very large degree, on internalisation and cultural reproduction. Activity theory focuses on extended working communities but the level of analysis is, necessarily, wide ranging (individual, social, and technological) and considers the historical dimension of the past and of future aspirations.

What is striking in the literature is that these theories almost pass each other by. Where there is debate, it is spiteful, even warlike. Too often, when educators ask how people learn the answer contains a great deal of posturing in the form of theoretical positioning and privileging. Yet it seems to me that there can be no question of any of these theories, in contrast to the others, being right or wrong. They are theories of different 'things'. Humans in real settings, roam across the fields of these different lenses. Mind interacts with experience in different settings at many levels. It seems inconceivable that these interactions are not artefact - mediated. If we consider knowledge to be an artefact then this mediation is a truism.

Needed is an attempt at theoretical integration. When we ask what gear we drive a car in, we offer a contingent response, not a quasi theoretical diatribe. Theoretical integration would be an attempt to describe the gear box rather than a cog wheel.

Some problems in our way towards theoretical integration are:

- 1.lack of communication between different research communities
- 2.lack of a view on what integration would look like
- 3.a concern that available theories have, at heart, fundamentally irreconcilable view of knowledge and social values

In educational terms these look like the concerns of philosophers lost in thought whilst we go missing in action. In education, we need to know more about the relationships between practices and policies on the one hand and desired educational outcomes on the other. We need this knowledge cashed out in terms of 'what to do, Monday' and we need this on the basis of best critical action. We need a theory of learning, which encompasses a theory of educational change. We see in the fields I have surveyed a lot of good hearted busy work. What it says for educational systems is currently lost in it dis-integration.

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