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## No Royal Road to Learning: A Commentary on Constructivism

Roger Miles  
London

### Introduction

In a recent attempt to distance myself from post-modern evaluators, I said I am an empiricist, a metaphysical realist, an opponent of cognitive relativism, and warm to the old-fashioned virtues of argument, evidence, hypothesis and test (Miles, 1996, pp. 44-45). Most scientists would find nothing to dispute in this statement, though they would certainly think it pompous. Nevertheless, it represents a creed opposed at least in part by Hein (1992, 1995a, 1995b) in his accounts of constructivism. What does all this mean, and what exactly is the problem?

Realism asserts there is a world to be investigated that exists independently of the human mind. Anti-realism (or idealism) asserts the opposite; there is no independent reality to which anyone, anywhere can gain access. Hein (1992, p.89) supports the anti-realist position, and argues that it makes a difference to our work, 'whether we consider knowledge to be about some "real" world independent of us, or whether we consider knowledge to be of our own making', because 'our epistemological views dictate our pedagogic views' (or alternatively, 'profoundly influence our approach to education', Hein, 1995a, p. 21). Hence his support for constructivism, rooted in the idea of 'knowledge

we construct for ourselves as we learn'. This raises two main questions:

- Are we justified in taking an anti-realist stance?
- Do our epistemological views – concerning the methods and validation of knowledge – determine our pedagogic views; more specifically, regarding anti-realism and constructivism, if we have one must we have the other?

We should also discriminate between constructivism as theory – we construct meaning for ourselves – and constructivism as a set of learning principles (Table 1). Hein (1992) presents the principles as following inevitably from the theory, *which I here accept*, though in a more extended account we might wish to examine this assumption.

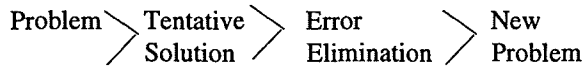
### Realism and Anti-realism

We cannot step out of our world and demonstrate that either realism or anti-realism is correct. Both are beyond our direct experience, which is why I have referred to myself as a metaphysical realist. Furthermore, realism and anti-realism are directions along a continuum rather than positions (Hein, 1995a), and both extremes are untenable (Williamson, 1995). Yet this does not mean that adopting a realist or anti-realist stance is *merely* a matter of fashion, taste or belief. I suggest we can make a rational choice by looking at the consequence of adopting one or the other. In particular, I propose that realism comes with some distinct advantages, and anti-realism with some distinct dangers.

Many scientists are unquestioning realists, all too happy to follow the 400 year old advice of Francis Bacon and, 'throw aside all thought of philosophy or at least expect but little and poor fruit from it' (Wolpert, 1992, p.122). They are concerned only to get on with the job of uncovering nature's secrets. This search for understanding, based on the 'sure knowledge' that scientific theories grapple with an external world that is rational and exhibits regularities, has been *the* great motivating force behind science, our great intellectual adventure and our major cultural achievement in the 20th century. We may not always like the results of science and their application in technology; we may regret that science has no equivalent of the Hippocratic oath to regulate the behaviour of its practitioners; we may find much of it incomprehensible; we may feel it is inherently dangerous. But none of this alters the simple fact that science has been successful as a coherent and orderly problem-solving concern, and that science and technology have delivered the goods. We are led almost irresistibly to the conclusion that we can only do science because the physical world is built on order and regularity, and this *compels us to be realists* (Trigg, 1993): Realism is 'the only sensible hypothesis' (Popper, 1972, p. 42). For want of space I am unable to present arguments against anti-realism, but note Hamlyn's (1995, p. 388) conclusion that, 'the only positive argument for idealism of any form is to be found in the representative theory of perception,

and that theory is false.'

It is extremely difficult to define science as a human activity, and prescribe how it should be done. One problem is that doing science is not necessarily the same thing for, e.g. a biologist and physicist, and there is no reason to select one discipline over another as a model of good practice. Nevertheless, Popper's (1972) formulation...



implies something that most scientists recognise as central to their work: That doing science means checking our observations and theories against nature, and modifying them when they conflict with nature. In Gellner's (1992a, p. 147) words, 'the elimination of ideas contradicted by fact, is the one offer which the rational mind cannot refuse'. This is why I call myself an empiricist, meaning I give weight to observation and experiment (I do not imply that sense data are our only sources of knowledge), and regard evidence and argument as means of getting to the truth. We often refer to the approach in Popper's scheme as trial and error, except by this we don't mean any old trial and any old error. Science is a rational activity (not the same as saying that all scientists are rational). Of course, as human beings, scientists bring their prior assumptions, values and prejudices to bear on their work. However, in the longer run it is not these factors, but evidence and argument, that determine what comes to be regarded as truth. This truth is independent of any particular perspective.

In science we accept that reality is independent from our theories, but believe we gain insight into the real world, and may progress closer to the truth by recognising our errors and replacing our theories with better ones. Sociologists of science tend to adopt a different view. They may well accept there is a real world out there not dependent on the human mind for its existence, but argue that since we all believe we cleave to the truth, and can usually demonstrate this to our own satisfaction, accounts of the world are dependent on the capacities and training of observers, and are the products of political activity rather than objective scientific activity. Hein (1992, p.89) takes a much firmer stance against realism, stating that 'Learning is not understanding the 'true' nature of things, ... but rather a personal and social construction of meaning out of the bewildering array of sensations which have no order or structure besides the explanations ... we fabricate for them.' If I understand correctly, there is no real world out there, just formless chaos.

The upshot is the same whichever of these last two positions we adopt: Truth is nothing to do with 'correspondence to the facts' but is simply what is accepted by particular groups of people at particular times. This leads us into the slippery world of relativism wherein, in its full-blooded version, what any given individual believes is true for him or her, and there is no rational way of resolving differences of

opinion. As ways of knowing, myth and superstition receive equal billing with science; a physician's prognosis has the same value as that of a clairvoyant. Unfortunately, relativists have not been able to explain how they know they are right when, *ex hypothesi*, nobody, anywhere can be right because there is no such thing as being right.

Relativism hit the front page of the *New York Times* last year in a discussion about the arrival of humans in the Americas (Boghossian, 1996). According to one archaeologist, the Native American explanation of the Zuni people, that humans emerged from a sub-terranean world of spirits, is just as valid as the scientific explanation that they arrived from Asia across the Bering Strait over 10,000 years ago. 'Science is just one of many ways of knowing the world' (Anyon quoted in Boghossian, p.15). However, as Boghossian points out, the claim that Zuni myth is just as valid as scientific archaeology can be interpreted in three ways: (1) as a claim about truth, (2) as a claim about justification, and (3) as a claim about purpose. It is immediately clear that, as a claim about truth, both explanations cannot be correct at the same time, and therefore 'just as valid', because they contradict each other. Moreover, there is no standard against which a post-modernist might argue that the Zuni myth is true, because the only possible standard is realism, which is said, *a priori*, to be non-existent or inaccessible. The claim about justification is founded on the notion that the evidence is insufficient to enable us to decide between the competing explanations. But this is self-evident nonsense given the richness of the archaeological evidence. The claim about purpose states that myth serves one function and scientific explanation another, and each is justified according to its own rules of evidence. This may be true, but is irrelevant to the claim 'just as valid', because there is no point of contact between the two explanations and therefore no possibility of weighing one against the other.

My chief argument against relativism is a development of the argument against anti-realism, based on the success of science. It comes from the historical fact of the spread of Western science-technology culture throughout the world, and is an argument grounded in a realist epistemology, and standards of scholarship and intellectual responsibility that accept notions of good and bad, right and wrong, and so on. In Gellner's (1992b, pp. 61-62) words again:

One particular style of knowledge has proved so overwhelmingly powerful, economically, militarily, administratively, that all societies have had to make their peace with it and adopt it. Some have done it more successfully than others; but all of them have had to do it, or perish.

As Gellner further remarks, this formulation 'has nothing to do with a racist, or any other, glorification of one segment of humanity over another. It is a style of knowledge and its implementation, not any category of personnel, which is being singled out...'. The conclusion I draw in answer to

the first of my main questions is, therefore: No, there is no compelling reason to adopt anti-realism. On the contrary, there are excellent grounds for accepting the existence of an independent reality, to which we can gain access through the methods of science.

### Do Our Epistemological Views Determine Our Pedagogic Views?

Before examining the second of my two main questions, concerning the relationship between epistemology and pedagogy, we should note a close parallel between constructivist learning theory and constructive theories of perception. The latter state that perception is an active process during which we draw on past knowledge and experience to impose meaning on sensory data. The alternative theory states that perception depends only on sensory input, which is rich in information. In other words, 'the most valuable content of the mind' has 'never passed through our senses' versus there is 'nothing in the mind which has not previously been in the senses' (Gellner 1992a, p.14). Both approaches present problems, e.g. constructive theories make it difficult to understand why perception is typically accurate (because we all do our own thing), and sensory-input theories why we ever suffer perceptual failures (because we all receive exactly the same information). The most reasonable conclusion is that perception depends on both constructive and sensory-input processes, and that the relative importance of these factors varies from instance to instance (Eysenck & Keane, 1990). Similarly, I suggest that constructivist learning theory is incomplete. It cannot, e.g. explain why shared meanings are so widespread. Moreover, we do not normally act, at least in formal education and in museums, as though this theory were complete. What I am saying is: Yes, we do construct meaning for ourselves, but this is not the whole story.

Turning now to constructivist learning principles, and looking at the left-hand column in Table 1 (based on Hein, 1992, pp. 90–91), I am reminded that it all began long before constructivist learning theory. Humans have been teaching and learning successfully for hundreds of generations, the matter being too urgent to await the academy. Hein acknowledges this and refers particularly to the work of the American philosopher and educator John Dewey (1859–1952). I believe that most of the principles are as old as the relationship between teacher and pupil, or master and apprentice, or both. Concerning active involvement, for example, Horace (65–8 BC) noted that, 'Wisdom is not wisdom when it derives from books alone', and regarding motivation, Leonardo da Vinci (1452–1519) remarked that, 'study without a liking for it spoils the memory, and it retains nothing it takes in' (Charlton, 1994, pp. 51, 60).

The right-hand column in Table 1 juxtaposes my comments – overlapping but not identical with Hein's – to show how constructivism might relate to what we can call 'current

museum practice'. These precepts are widely familiar, and certainly I feel I have spent my professional life as a museum manager trying to put them into practice (e.g. Miles, 1986). We can contrast them with 'traditional museum practice', based almost exclusively on the method of 'show and tell' and the *assimilation* of information into the mind. Can we really say that our epistemological views determine our pedagogic views, when our educational practice has preceded our educational theory? I show four possible combinations in Table 2 to help us examine this question further. Hein adopts the combination in the top right cell (anti-realist/constructivist), and I claim for myself a place in the top left cell (realist/constructivist), on the grounds that my design precepts embody constructivist principles of learning. If we accept this (differing epistemologies/same design principles), we cannot claim infallibly to predict the epistemological stance of a museum practitioner by looking at his or her exhibits. But only if we could, would we be justified in claiming that our epistemological views dictate our pedagogic views. Does Hein's argument apply in the more limited case of traditional museum practice? Certainly many older exhibitions, e.g. in large national museums of history in Europe, are both traditional in style and I would guess based on a realist epistemology (bottom left cell of Table 2). But are we to believe that the curators in say the British Museum, arguably the most traditional museum in the whole of the UK, are uninfluenced by the post-modern turn of thought? Might we not find a traditionally-arranged, show-and-tell anthropology exhibition with labels that betray a relativist, and therefore anti-realist, stance (bottom right cell of Table 2)? Surely the answer is yes. And we cannot explain away this conclusion by saying that such curators have no educational theory, for they tend to hold high-minded opinions about the educational role of museums and how they should address their visitors, whether we agree with them or not. So a traditional exhibition might equally be based on a realist or anti-realist epistemology.

Hein (1995a, fig. 2) orders museums along rectangular coordinates for learning theory and epistemology, and presents a conceptually similar analysis to that in Table 2. This yields (1) the Constructivist museum (anti-realist/constructivist), (2) the Discovery Museum (realist/constructivist), (3) the Orderly museum (antirealist/assimilative), and (4) the Systematic museum (realist/assimilative). I remain unconvinced we can separate types (1) and (2), or (3) and (4), on the basis of their observable characteristics, and therefore infer their epistemological foundations. The answer to my second main question is, then: No, there is no necessary cause and effect relationship between our epistemological views and our pedagogic views, particularly when it comes to the design of educational exhibits. This does not prevent us accepting constructivist learning principles on the pragmatic grounds that experience has shown their value, but they may in themselves be incomplete because the theory on which they are based is incomplete.

## Does Meaning Matter?

One consequence of the combined constructivist/anti-realist stance is that each learner, 'creates his or her own model to explain nature'. Hein (1992, p.90) admits that 'most of us constantly vacillate between faith that our learners will indeed construct meaning which we will find acceptable (whatever we mean by that) and our need to construct meaning for them...'. But nevertheless he affirms his 'desire to let learners construct their own world'. How are we to interpret these words? Do we really let learners construct their own world? We must look at the evidence from day-to-day life, formal education and museums.

The logic of full-blooded relativism insists, no doubt, that Aristotle's Law of Motion – which happens to be close to our intuitive, naive interpretation – is just as valid, *qua* 'another way of knowing', as modern science – the 'dogma imposed by the long post-Enlightenment hegemony over the Western intellectual outlook', in Sokal's ironic phrase (quoted in Boghossian, 1996, p.14). Nevertheless, it's hard to see a gunner, who insists that shells go in a straight line and suddenly fall vertically, prospering in the US artillery. Similarly, our relativist might wish to claim that the germ theory of disease is unproven, as one recently explained in an English newspaper, and no more valid, say, than a revived theory of miasmatic vapours. But surely if struck by blood-poisoning she would be wise to think twice, and swallow her pride ... as well as her physician's antibiotics. It seems hardly necessary to labour the point with further examples from this theatre of the absurd.

What is the evidence from formal education? Most European countries have a National Curriculum. The UK Government introduced its compulsory Curriculum for England and Wales in 1988. Schools must by law teach to their students, from ages five to 16, three core subjects (English, Mathematics, Science), and six foundation subjects (Art, Geography, History, Music, Physical-education and Technology). Children take tests at ages seven, 11 and 14, and unless their answers correspond precisely to what the examiners consider to be correct, they are failed. Examiners throughout the country are trained to accept one and only one answer. What scope here for children to 'construct their own world'? We are left to ponder whether the Government and its educational advisers, not just in England and Wales but in most European countries, are engaged in a conspiracy against learning, or whether, when the future of nations is at stake, we cannot afford the distraction of letting learners live in worlds of their own construction.

Are things fundamentally different in museums and exhibitions? If they were, and we were happy to let things go with visitors constructing their own meanings, we would have no basis for any evaluation (e.g. formative evaluation) that involves a comparison between our messages and the visitors' interpretations. Research on alternative conceptions

('naive knowledge', Borun, Massey & Lutter, 1993) would be reduced intellectually to the status of stamp collecting – a search for amusing rarities. Calver (1939, p. 345) provides an early example of visitor-constructed knowledge at variance with the exhibitor's message:

At the Museum of Natural History in New York there is an exhibit which aims to show the value of inoculation against typhoid fever. The model represents soldiers in the Spanish American War which occurred before soldiers were inoculated. It shows that out of every 100 soldiers 14 were afflicted with typhoid for every one injured by gunfire. The reaction of an intelligent man who saw this exhibit recently was, "What safe wars they used to have."

I wonder if any front-line soldier – for whom death is death, however visited – would accepted 'safe war' as a valid construct, or if any evaluator feels this visitor's interpretation reflects successful communication? To say yes surely returns us to the theatre of the absurd.

My claim is that teachers in formal education, and communicators in the informal setting of museums, are usually concerned to teach the truth – or, in areas of doubt and uncertainty, competing theories of the truth – and present the world as we currently understand it. I believe this applies not only to the scientist but also, e.g. to the post-modern archaeologist. An archaeologist is presumably anxious to communicate an accurate account of Zuni myth, and would be just as distressed as the scientist to find his or her message scrambled in some curious alternative conception. Very few of us would, I suggest, agree 'that our intentions are irrelevant' (Hein, 1995b, p. 190).

I have overlooked differences in the formal and informal setting in the above discussion because my broader frame of reference, Lewis's (1988, pp. 33–34) 'plain English theory of education', applies equally in the classroom and in the museum (or to the museum as teacher and as a place to learn; Hein, 1995b). This theory states that the aspiring learner must at all times know what is going on, know what to do, want to do whatever he or she is supposed to do, be given appropriate opportunities to do it, and know when he or she is doing something wrong. As Lewis remarks (1988, p. 38, my additions in square brackets):

Learning is essentially a creative process, and the burden of it is always upon the learner. The teacher [designer of educational exhibits] cannot make it happen, but the would-be learner *can* stop it happening. The teacher [designer of educational exhibits] can also stop it happening by omitting to arrange conditions that are necessary for it to happen, or by introducing elements that prevent it from happening.'

We cannot stop visitors coming to their own interpretations, but I do not think we should be happy about this. On the contrary, we should be concerned to communicate our

preferred readings through the power, clarity and relevance of our work, making full use, *inter alia*, of our skills as evaluators. We should not, 'desire to let learners construct their own world' without let or hindrance, and I do not think we normally are. To claim that we do surely raises the same question as constructive theories of perception: If these are necessary *and sufficient*, why are we not more often hallucinating?

### What More Do We Need?

If constructivist learning theory, and therefore constructivist principles of learning, are insufficient, what more might we need, particularly in terms of input from the learning environment? We can begin to answer this question by comparing left and right columns in Table 1. The additional factors in the right column include the role of the teacher (or designer of educational exhibits) and structure (or conceptual framework), and I will limit my discussion to these, within the framework of Lewis's 'plain English theory of education'.

Hein (1992, p.89) says that one of the dramatic consequences of constructivism is that 'we have to focus on the learner in thinking about learning (not on the subject/lesson to be taught)'. I want to stress then, that the teacher and the exhibition designer count too, and we should not overlook them in focusing too tightly on the learner. I decided at school to become a scientist because I was lucky enough to be taught by an inspiring biology teacher. I decided to become a vertebrate palaeontologist in my last year at college because I was taught by an inspiring professor of geology. I believe my experience of following a particular career path, because I came across an inspiring teacher, is not uncommon. We rightly value intrinsic motivation and earnestly discuss how museums can be places where people are motivated to fulfil their dreams, but I believe we make a mistake when we concentrate over much on the learner and underplay the role of the inspired, and inspiring, teacher or designer of educational exhibits as the trigger of this motivation. (Parenthetically, I suggest that good teachers are driven by the knowledge they have something important to say, that they are dealing in the truth, and wish to guide their students to that truth; their intentions are thus far from irrelevant.)

I want now to turn to structure, and Hein's comment about not focusing 'on the subject/lesson to be taught'. I readily accept that we learn throughout our lives by, among other means, constructing meaning for ourselves out of our experiences. However, we check our tentative meanings against those of others, and against the evidence of our physical world – according to some, the process is analogous to scientific enquiry – because when it comes to things that matter, we tend not to live in a private world of our own making. Our gunner in the US artillery must soon abandon his naive interpretation of shell trajectory, despite the relativist's reassurance that one way of knowing is just as valid as

another. Our social scientist must accept her physician's antibiotics or risk martyrdom for her scepticism towards biology.

Accepting that we pick up snippets of information as we pass through a museum, and that exhibits are sometimes visited in the 'wrong order' and normally have a high 'skip rate' (Beer, 1987), what does this tell us about organizing exhibitions? One radical response has been to say that structure, in the sense of a storyline reflected in the layout of the exhibits on the floor of the museum, is irrelevant. 'Why bother', the argument goes, 'when the visitor bounces around like a ball in a pinball machine?'. I think the answer is fairly simple, and is equivalent to pointing out that the pins in the pinball machine have a fixed position. Given that the learner in a museum needs some sort of connecting storyline to relate, one to another, any snippets of information that he or she has picked up, I cannot see any argument for complicating the visitor's random behavior with a random arrangement of exhibits. And what about the visitor whose attention is successfully attracted by an exhibit? Might not he or she expect the next exhibit to follow on in some fairly obvious way, which would seem to be essential if the exhibition is to make any sense at all? This does not rule out the possibility of multiple paths through the exhibition (cf. Hein, 1995a).

Structure becomes important at some organizational level between the overall exhibition and the individual exhibit label. This may well be at the level of the overall exhibition in a storytelling exhibition that develops a cumulative argument, or at the next level down, that of groups of exhibits, if the exhibition is episodically organized with a number of loosely connected sub-themes that can be dealt with in any order. The important point is that structure becomes relevant at some level, and always embraces the lowest levels of text panels and labels. We have many ways of ordering topics to give a sound storyline at any level of organization, and may employ several in one exhibition. These are not always, or even usually, logical orderings (cf. Hein, 1995a), and one classification (B. N. Lewis, pers. comm.) recognizes three categories:

- Psychological orderings – there is some psychological advantage in dealing with *this* before *that*, e.g. simple to complex, beginning to end, concrete to abstract.
- Logical orderings – these arrange topics into necessary dependency relationships, e.g. inductive reasoning (give the examples and then draw out of them the rule) or deductive reasoning (give the rule and then exemplify it with a series of examples).
- Epistemological orderings – the body of knowledge we wish to communicate has certain features that make it desirable to deal with certain things before others as a ground clearing exercise, e.g. we may need to explain the technical meaning of 'species' at the beginning of an exhibition on the evolution of species.

The first point I wish to draw out of this brief discussion

**Table 1. Educational Principles and Precepts**

<b>Constructivist principles of learning</b>	<b>Precepts in current museum practice</b>
Learning is an active process	Provide hands-on exhibits
Learning involves constructing meaning and systems of meaning	Provide a conceptual framework so that visitors can begin to make sense of exhibits rather than settle for disparate fragments of information
Meanings are constructed in the mind	Avoid hands-on exhibits that fail to engage the mind
Learning involves language; people talk to themselves as they learn	Design exhibits to stimulate discussion and social learning
Learning is a social activity	
Learning is contextual; we learn in relationship to what we already know, what we believe and so on	Connect your message to the visitor's everyday world
Learning needs pre-existing knowledge, i.e., some structure developed from previous knowledge to build on	Know your audience, its entry knowledge and its misunderstandings, and speak to it in a language tailor made to its needs
Learning needs time and rehearsal	Aim to launch visitors on a path of learning and give enough information to enable them to proceed further
Motivation is essential for learning	Intrinsic motivation is important in museum learning, but inspired teaching (exhibition design) can make a difference

**Table 2. Pedagogical and Epistemological Combinations.**

	<b>Realist epistemology</b>	<b>Anti-realist epistemology</b>
<b>Constructivist museum practice</b>		
<b>Traditional museum practice</b>		

is that structure is important in giving visitors a conceptual framework they can use to begin to make sense of exhibits rather than settle for disparate snippets of information. Secondly, structure is important to understanding or, in terms of Bloom's (1956) much misrepresented *Taxonomy of Educational Objectives*, in climbing from 'Knowledge' to 'Comprehension'. I can illustrate this by reference to Charles Darwin's theory of natural selection. We may indeed come across ideas relating to this theory as we go about our daily lives, e.g. 'nature red in tooth and claw', and we may indeed construct for ourselves some sort of prototype meaning for natural selection that we can continue to think about and develop. Moreover, a visit to a natural history museum may well give rise to experiences that bolster this process. But the fact remains that we can only truly comprehend the theory of natural selection, and apply it in novel circumstances, once we have fully comprehended its four premises: reproductive potential, competition for resources, inheritance and variation. It took Charles Darwin many years to construct his theory of natural selection, and another great scientist, Darwin's friend and protector Thomas Henry Huxley, is said never to have properly understood it. What price then, ordinary visitors to the museum constructing any sort of coherent meaning for themselves, unless we make the most strenuous efforts to *guide them* to the correct interpretation, telling our story in such a way that they can 'read' and make sense of it (Tunncliffe, Lucas & Osborne, 1997)? Interestingly enough, Hein (1992, p.92) cites an example from the Boston Museum of Science where some visitors 'did not have the organising principles' to understand the messages. But I am unclear as to where these 'organizing principles' should come from if we allow that learners construct their own systems of meaning.

My final conclusion in this commentary on constructivism is, put in museum terms, that we should not over-emphasize the role of the learner at the expense of the contributions made by the designer of educational exhibits and the museum educator, or at the expense of the subject-matter to be communicated. All three are important to the educational role of museums, and all three deserve the full weight of our attention.

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