

## The Hein-Miles Debate: An Introduction, Explanation, and Commentary

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George Hein and Roger Miles were keynote speakers at the 1997 Visitor Studies Conference in Birmingham, Alabama. They debated the constructivist approach to exhibition interpretation. Hein presented the case for constructivism and Miles offered a critique. Hein's paper will appear in the Conference papers to be published later. Miles' paper critiquing constructivism is published here with Hein's response.

As a reader you may ask, "Why should I make the effort to closely examine the arguments presented in this issue?" Here are at least two good reasons:

- If you don't understand the issues, you are more likely to be persuaded by pleasant-sounding, but fallacious arguments. Should we accept the argument that we must either focus on the learner or the subject matter?
- A more serious implication of this debate is accountability. If we accept the arguments of constructivism, exhibit designers could more easily argue that all of their exhibitions are successful because visitors "make their own meaning."

Readers are encouraged to obtain the Conference papers for Hein's original comments. In addition, a number of Hein's papers are available for those who wish to delve deeper into the constructivist approach (see references). However, I have not found any major sources that specifically counter the constructivist approach. This issue may be one of the best sources of the alternative viewpoint for museum professionals. More generally for the realist position, a good introduction to the scientific view can be found in American Association for the Advancement of Science (1990). *Science for All Americans*. Here are sample quotes from this publication:

"Science presumes that the things and events in the universe occur in consistent patterns that are comprehensible through careful, systematic study. .... Science also assumes that the universe is ... a vast single system in which the basic rules are everywhere the same. Knowledge gained from studying one part of the universe is applicable to other parts. For instance, the same principles of motion and gravitation that explain the motion of falling objects on the surface of the earth also explain the motion of the moon and planets." (p. 2)

"Although scientists reject the notion of attaining absolute truth and accept some uncertainty as part of nature, most scientific knowledge is durable. The modification of ideas rather than the outright rejection, is the norm in science, as powerful constructs tend to survive and grow more precise

and to become widely accepted. The growing ability of scientists to make accurate predictions about natural phenomena provides convincing evidence that we really are gaining in our understanding of how the world works." (p. 3)

The arguments presented by Miles and Hein in this issue are difficult to understand unless one is familiar with the philosophical basis of these arguments. Philosophers have debated these issues for many centuries and will continue to do so for many more. I hope this introduction to the debate will assist those less familiar with the literature. Given my academic background, it is difficult for me to be neutral in this debate. My training and career as a research psychologist place me in the camp of realism and, more specifically, logical empiricism, the predominant philosophy within the scientific community (see page 4). I thank Hein for stimulating me to review the literature and to think more seriously about the issues. I am more solidly in the camp of the realists and logical empiricists after studying many of the writings of constructivists. I have, however, spent a considerable amount of time reading both viewpoints and have a better understanding of the constructivist view than when I began. Criticism, however, is a dangerous endeavor. Inevitably, we argue from a less knowledgeable (as well as biased) position when we criticize a viewpoint different than our own.

### Basic Assumptions of Each Viewpoint

The box on the next page includes common basic assumptions of constructivism and logical empiricism. Note that they do not necessarily represent the views of any one individual whether from one viewpoint or the other. They represent a composite to give a frame of reference to the reader.

### Roger Miles

Roger Miles' article in this issue addresses some of George Hein's statements in recent publications (Hein, 1992; 1995a; 1995b). Miles deals with two questions: (1) How defensible is an anti-realist position? and (2) Does our philosophy of knowledge determine our methods of designing educational messages?

*Realism vs. Anti-Realism Philosophy.* Miles argues that the success of science is the main evidence that a realist view is preferable to an anti-realist one. Science is successful because it has worked for us; it is the basis for the astounding feats of engineering, medicine, etc. that we have benefited from in the last few hundred years. Compare the predictions of science with those of astrology or other pseudosciences.

Miles suggests that the constructivist philosophy leads to a relativistic view of knowledge in which one theory of knowledge is considered as good as any other. If learners construct their own meaning and if that's acceptable to the teachers (or exhibit designers), then one meaning is as good as another. Miles points out some of the problems with this line of reasoning.

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## BASIC ASSUMPTIONS

### Logical Empiricism (Scientific Viewpoint)

1. There is a real world that follows lawful principles and we can understand at least approximations of this world. This is, of course, one of the basic assumptions of scientific realism. Science attempts to discover (or invent) these principles in order to predict and control natural events. A scientific law (e.g., water boils at 212 degrees fahrenheit at sea level) allows us to more effectively manipulate the world to our advantage. In that sense, the "truth" or validity of science is assessed in terms of its utility.
2. Our knowledge is based on both empirical (observable) facts and logical (inductive and deductive) reasoning. We start with observations and attempt to draw conclusions about how events are related either by correlation or causation. Once we have collected our observations and inferred a systematic pattern, we test our reasoning by predicting future events.
3. The lawful principles of science do not change from moment to moment or are not suspended by miracle workers. Divine intervention cannot eliminate the force of gravity and allow us to fly or walk on water. The force of gravity operates on all objects and is predictable with mathematical precision.
4. While logical empiricism does not dictate methods of transmitting knowledge, it is reasonable to use the measurement techniques of science to evaluate the effectiveness of education. Techniques that produce more accurate learning (match between intention and impact of message) are considered more effective. Thus, simple didactic educational techniques (mere exposure of information) is usually less effective than hands-on methods that involve the learner.
5. Most, if not all, educators of science would argue today that critical thinking skills are an important part of scientific thinking. These skills include skepticism, the use of good logic, and the like.
6. Objective knowledge should be distinct from value systems. Although ethics/morality are important to science and influence the work of scientists, when morality is confused with empirical fact (i.e., what "should be" with "what is"), scientific thinking often becomes distorted.

### Constructivism (Anti-Realist Viewpoint)

1. Personal meaning. The learner constructs his/her own meaning from an experience. There may be some social consensus among teachers and learners regarding this meaning, but this does not imply that knowledge is an accurate representation of reality (in fact, there is no one reality). It is often not clear how "meaning" is defined by constructivism (see page 5, "What Does it Mean...").
2. Knowledge is relative rather than absolute. Multiple viewpoints are encouraged because there is no known objective reality. All explanations have equal merit. A softer view is that there are different kinds of knowledge, scientific knowledge being only one of many. Hein appears to take the position that the criteria for scientific knowledge are acceptable to him (see pages 14-15). Does this mean that some criteria are more acceptable for certain types of knowledge but not others?
3. Learning is unpredictable. Learning outcomes cannot (and should not) be carefully structured (Hein, 1995a). This idea seems to follow from the "personal meaning" assumption. Since all learners make their own meaning from knowledge, the outcome of learning cannot be predicted. It is not clear how one can avoid educational anarchy if it's up to the individual to construct his/her own meaning from a learning experience.
4. Focus on the learner. The emphasis of education should be on the learner rather than on the subject matter. The learner should be free to construct his/her own meaning. While Hein has explicitly stated this in previous writings, his current views appear to have changed (see page 15).
5. Learning environments should be flexible. Too much structure will interfere with learning. Hein suggests that the learning environment must remain unstructured if optimum learning is to occur.
6. Specific goals and objectives of learning are inappropriate. You cannot specify learning outcomes because that would dictate goals and stifle the learner's opportunity to come up with his/her own mental constructions. This makes curriculum development a real challenge! [Apparently, critical thinking as an educational goal is not acceptable because it is a goal.]

*Relation between theory of knowledge and teaching methods.* Hein has argued in the past that one's theory of knowledge dictates one's teaching methods. Miles contends that this is not so. The design approaches used by Miles in the Natural History Museum (London) based on hands-on methods (similar to those described as constructivist by Hein) are not exclusive to the constructivist philosophy. If non-constructivists also adopt these same methods, one cannot claim that they are the exclusive domain of constructivism and the philosophies of constructivism and realism do not predict differential teaching methods. Following Miles' reasoning, the principles of learning must be independent of a realist or constructivist philosophy.

Miles describes Hein's views of museum practice as divided into two camps — "constructivism" and "traditional/current museum practice." Miles points out that the exhibit methods described by Hein as "constructivist" have been applied by many museum practitioners from nonconstructivist frameworks including his own work at the Natural History Museum (London).

Miles also questions Hein's emphasis on focusing exclusively on the learner in thinking about learning (not on the subject/lesson to be taught). Miles suggests that both are equally important.

### George Hein

George answers some of Miles' criticisms of constructivism. He also contends that at least some of his earlier work has been misunderstood, and he welcomes the opportunity to correct some of this misunderstanding.

Hein's article addresses three arguments presented by Miles:

1. *The success of science is based on a realist view of the world.* While Miles seems to be arguing that the byproducts of science have been extremely beneficial in 'delivering the goods,' Hein focuses on the issue of whether or not science as a representative of realistic thinking can be shown to approximate the truth.

Hein (page 14), in reference to scientific theories, states: "I argue that these [scientific theories] are constructions, not mirrors of reality." Hein seems to infer that they cannot be both "constructions" and "mirrors of reality." It is not a question of either one or the other. Theories are constructions that attempt to mirror reality. We test this assumption by predicting future events. For example, we might test Newton's theory of gravity by predicting how fast objects will fall to the ground.

Hein denies that scientific explanations lead us closer to a real world (although, curiously, he accepts the criteria of science for assessing knowledge). This is difficult to interpret. Apparently he accepts the explanations of science, but denies that they approximate a real world. If these explanations are merely personal meanings rather than approxima-

tions or mirrors of reality, why have so many of them withstood the scrutiny of replication, generality, reliability, validity, etc.?

A comment may clarify at least one of Hein's misconceptions with regard to scientific theories. Levy (1997) makes a distinction between Type E (event) and Type C (construct) theories. Type E theories are confirmable because they lend themselves to direct measurement. Questions such as, "How did the patient acquire an infection?" "When did life first appear on earth?" provoke theories that can be directly measured. Type C theories, on the other hand, are not directly observable. The explanations involve intangible abstractions. Theories of gravitation, magnetism, electricity, light, and energy involve explanations that are not directly observable. We cannot observe gravity, although we can develop a theory that predicts how fast an object will fall when dropped from a high place. Whereas Type E theories can be evaluated in terms of their accuracy, Type C theories must be assessed in terms of their utility. How useful is the theory in terms of predicting events?

2. *Epistemology does not determine pedagogy.* Surprisingly, Hein now agrees that one's philosophical view does not dictate teaching methodology (i.e., "epistemology does not determine pedagogy"). Hein's previous writings have explicitly stated the opposite (see Hein quote on page 7).

3. *National Curricula and Realism.* Hein argues that "the orthodoxy of national curricula do not argue for a realist position." He points out that the curricula differ among countries, they change from time to time, and there is considerable debate about what the curricula should be. Hein seems to miss Miles' main point in discussing curricula — the curricula of educational institutions attempt to teach scientific theories that are assumed to reflect the orderly nature of the universe. While there is disagreement over details, there is general agreement that learners should understand the main ideas of science.

### Some Additional Comments on Hein

Although there is much in Hein's writings that deserves further discussion, I have only space for the following.

#### What Does It Mean to "Make Meaning" of an Exhibition?

Hein does not offer a precise definition of how the learners "make meaning." However, based on the context in which this concept is used, we can speculate on possible meanings. If communication is to be clear, the meaning of terms must not change depending on the argument to be made. Since "meaning" is central to the constructivist viewpoint, I think it critical to explore the possible meanings of "meaning." Here are some possibilities based on cognitive psychology and communication analysis:

*Meaning #1. The educational message is interpreted in a distorted manner because the learner lacks the necessary*

*prerequisite knowledge.* Here, the learner does not have enough basic knowledge to interpret the message as it was intended. Consequently, the learner does the best he/she can and attributes a meaning based on knowledge already possessed.

*Meaning #2. The learner uses faulty reasoning in making conclusions from the educational message.* For example, there are a number of logical fallacies to which human reasoning is prone. The learner takes the information given in the exhibition, applies inductive or deductive reasoning, and comes to a correct or erroneous conclusion based on his/her logical reasoning skills.

*Meaning #3. Each learner derives a unique understanding of any or all learning experiences.* This interpretation assumes that, since every learner has a unique store of knowledge/mental constructions, new information is interpreted uniquely as it is assimilated into this mental framework.

There may be other possible interpretations, but it is important that we know exactly what interpretation is being used, otherwise the impact of the communication will not equal the intent. The first two meanings described above suggest an orderly pattern to miscommunications. That is, there are common ways of interpreting information that leads to communication distortions. For example, Borun and her colleagues (Borun, et al., 1993) have shown that learners' naive notions of the concept of gravity follow common patterns; however, it is possible to deliver the intended message if the exhibit is carefully designed and evaluated. Cognitive psychology textbooks are replete with studies that demonstrate orderly patterns to the way we interpret and use information. While the outcomes may not follow the rules of logic or may be influenced by the way a question is framed, or by the amount of effort necessary to make accurate estimates of probabilities, they nevertheless seem to be predictable.

Meaning #3, however, leads to a quite different analysis. If the message is truly unique with little common understanding, the situation is far different. The implication is that we could not find any lawful patterns in how learners construct meaning. Hein seems to use this interpretation some of the time. At other times (e.g., when he argues that there are socially shared meanings of knowledge), he must be referring to one of the other definitions since socially-shared meaning is logically inconsistent with this type of meaning.

#### **Evidence for Visitors' Making Their Own Meaning**

Hein uses a quote from Serrell (1997) to support his argument that visitors make their own meanings at exhibitions. Serrell states that "The visitor experience is not made up of what the exhibition offers, but rather it consists of what he or she chooses to attend to." The fact that visitors select to attend to some elements of an exhibit and not others does not preclude the possibility that visitors receive the message

intended by the exhibit designers. This is very ambiguous evidence for Hein's viewpoint.

#### **Hein's Logic**

In his zeal to advance constructivism, Hein has been guilty of faulty logic (something of which we are all guilty on occasion). Here is a brief summary of some of these fallacious arguments:

1. *Straw man argument.* He often misrepresents the opposing viewpoint. Example: Traditional scientific education is always didactic which is somehow tied to the philosophy of science. This is not true! Scientists in any field advocate hands-on research.
2. *False dilemma.* Arguments such as "You must focus on the learner rather than the subject" make it appear we have only two choices, when, in fact, we must study both if we are to really understand the learning process.
3. *Sweeping generalizations.* Two examples: "We can't predict the outcome of learning" and "All learning involves the making of meaning." We certainly can predict the outcome, although not as exactly as we would like. And, most experts in learning would argue there are many types of learning (e.g., classical conditioning, operant learning, observational learning, spatial learning, etc.) rather than just one.
4. *Unwarranted assumptions.* Example: "People do not learn if information is presented in a didactic way" or "We can't predict the outcome of learning."
5. *Appeal to authority.* Example: "If we accept constructivist theory (which means we are willing to follow in the path of Dewey, Piaget, and Vygotsky among others) ..." This seems to imply that these great men were all constructivists. I doubt that any of the three would embrace anti-realism.

#### **Conclusions**

While Hein reminds us that we must not place absolute faith in scientific knowledge, this idea is not foreign to current philosophy of science. To make it even more difficult to understand his position, his statements in this issue appear to contradict his previous writings. Are we to believe that he did not mean what he said in the past or that we made our own "meaning" of these words, or that he has changed his thoughts on these issues? I encourage readers to examine these papers and draw their own conclusions.

Further, his ambiguous use of terms such as "meaning" and his tendency to use fallacious arguments are designed more to persuade others than to advance our thinking on how to assess knowledge. Despite all of this controversy, I suspect that when the rhetoric is stripped away, Hein may not be far from current scientific thinking. Perhaps further public debate will help clarify similarities and differences between the constructivist and realist viewpoints.

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

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### 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,