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Constructivist Learning Theory

The Museum and the Needs of People
CECA (International Committee of Museum Educators) Conference
Jerusalem Israel, 15-22 October 1991
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Introduction
The latest catchword in educational circles is "constructivism, " applied both to learning theory and to epistemology---both to how people learn, and to the nature of knowledge.[1,2] We don't need to succumb to each new fad, but we do need to think about our work in relation to theories of learning and knowledge. So we need to ask: what is constructivism, what does it have to tell us that is new and relevant, and how do we apply it to our work? As far as I can see, there is nothing dramatically new in constructivism: the core ideas expressed by it have been clearly enunciated by John Dewey among others, but there is a new, widespread acceptance of this old set of ideas. and new research in cognitive psychology to support it. I would like to give a brief exposition of ideas central to constructivism and widely accepted today by educators. curriculum developers and cognitive psychologists, and then suggest what they mean for museum educators.

Constructivism
What is meant by constructivism? The term refers to the idea that learners construct knowledge for themselves---each learner individually (and socially) constructs meaning---as he or she learns. [3] Constructing meaning is learning; there is no other kind. The dramatic consequences of this view are twofold;

1) we have to focus on the learner in thinking about learning (not on the subject/lesson to be taught):

2) There is no knowledge independent of the meaning attributed to experience (constructed) by the learner, or community of learners.

Let me discuss the second point first because, although it appears radical on an everyday level, it is a position which has been frequently adopted ever since people began to ponder epistemology. If we accept constructivist theory (which means we are willing to follow in the path of Dewey, Piaget and Vigotsky among others), then we have to give up Platonic and all subsequent realistic views of epistemology. We have to recognize that there is no such thing as knowledge "out there" independent of the knower, but only knowledge we construct for ourselves as we learn. [4] Learning is not understanding the "true" nature of things, nor is it (as Plato suggested) remembering dimly perceived perfect ideas, 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 (and I stress the plural) which we fabricate for them.

I'm sure that many of you have had philosophy courses which have exposed you to these concepts, and you may accept this basic premise that there is no such entity as a Ding an sich whether or not we can perceive it. Yet we all tend to remain closet realists, and refute Bishop Berkeley, as Samuel Johnson did, by kicking the stone and feeling real pain. The more important question is, does it actually make any difference in our everyday work whether deep down we consider knowledge to be about some "real" world independent of us, or whether we consider knowledge to be of our own making? The answer is yes, it does make a difference, because of the first point I suggested above: in our profession our epistemological views dictate our pedagogic views.

If we believe that knowledge consists of learning about the real world out there, then we endeavor first and foremost to understand that world, organize it in the most rational way possible, and, as teachers, present it to the learner. This view may still engage us in providing the learner with activities, with hands-on learning, with opportunities to experiment and manipulate the objects of the world, but the intention is always to make clear to the learner the structure of the world independent of the learner. We help the learner understand the world. but we don't ask him to construct his or her own world.

The great triumph of Western intellectual history from the Enlightenment until the beginning of the 2Oth century rested on its ability to organize the knowledge of the world in a rational way independent of the learner, determined by some structure of the subject. Disciplines were developed, taxonomic schemes established, and all these categories were viewed as components of a vast mechanical machine in which the parts could be explained in terms of their relationship to each other, and each part contributed to making the whole function smoothly. Nowhere in this description does the learner appear. The task of the teacher was to make clear to the learner the working of this machine and any accommodation to the learner was only to account for different appropriate entry points for different learners.

However, as I have indicated above, constructivist theory requires that we turn our attention by 180 degrees we must turn our back on any idea of an all-encompassing machine which describes nature and instead look towards all those wonderful, individual living beings---the learners---each of whom creates his or her own model to explain nature. If we accept the constructivist position we are inevitably required to follow a pedagogy which argues that we must provide learners with the opportunity to: a) interact with sensory data, and b) construct their own world. [5]

This second point is a little harder for us to swallow, and 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; that is, to structure situations that are not free for learners to carry out their own mental actions, but "learning" situations which channel them into our ideas about the meaning of experience. A common example of the unresolved tension is our attitude towards

museum tours which explain exhibits to the visitor. I have repeatedly asked museum professionals if they personally enjoy guided tours, and they almost universally tell me that they try to avoid them at all costs. Yet, at CECA meetings (and this one is no exception) our colleagues frequently give us extensive guided tours through galleries, insisting on presenting the expert guide's interpretation, pace and selection to influence the viewer's perception and learning. It is this tension between our desire as teachers to teach the truth, to present the world "as it really is", and our desire to let learners construct their own world which requires us to think seriously about epistemology and pedagogy. [6]

Principles of learning

What are some guiding principles of constructivist thinking that we must keep in mind when we consider our role as educators? I will outline a few ideas, all predicated on the belief that learning consists of individuals' constructed meanings and then indicate how they influence museum education.

1. Learning is an active process in which the learner uses sensory input and constructs meaning out of it. The more traditional formulation of this idea involves the terminology of the active learner (Dewey's term) stressing that the learner needs to do something; that learning is not the passive acceptance of knowledge which exists "out there" but that learning involves the learner s engaging with the world. [7]

2. People learn to learn as they learn: learning consists both of constructing meaning and constructing systems of meaning. For example, if we learn the chronology of dates of a series of historical events, we are simultaneously learning the meaning of a chronology. Each meaning we construct makes us better able to give meaning to other sensations which can fit a similar pattern. [8]

3. The crucial action of constructing meaning is mental: it happens in the mind. Physical actions, hands-on experience may be necessary for learning, especially for children, but it is not sufficient; we need to provide activities which engage the mind as well as the hands.[9] (Dewey called this reflective activity.)

4. Learning involves language: the language we use influences learning. On the empirical level. researchers have noted that people talk to themselves as they learn. On a more general level. there is a collection of arguments, presented most forcefully by Vigotsky, that language and learning are inextricably intertwined. [10] This point was clearly emphasized in Elaine Gurain's reference to the need to honor native language in developing North American exhibits. The desire to have material and programs in their own language was an important request by many members of various Native American communities.

5. Learning is a social activity: our learning is intimately associated with our connection with other human beings, our teachers, our peers, our family as well as casual acquaintances, including the people before us or next to us at the exhibit. We are more likely to be successful in our efforts to educate if we recognize this principle rather than

try to avoid it. Much of traditional education, as Dewey pointed out, is directed towards isolating the learner from all social interaction, and towards seeing education as a one-on-one relationship between the learner and the objective material to be learned. In contrast, progressive education (to continue to use Dewey's formulation) recognizes the social aspect of learning and uses conversation, interaction with others, and the application of knowledge as an integral aspect of learning. [11]

6. Learning is contextual: we do not learn isolated facts and theories in some abstract ethereal land of the mind separate from the rest of our lives: we learn in relationship to what else we know, what we believe, our prejudices and our fears. [12] On reflection, it becomes clear that this point is actually a corollary of the idea that learning is active and social. We cannot divorce our learning from our lives. [13]

7. One needs knowledge to learn: it is not possible to assimilate new knowledge without having some structure developed from previous knowledge to build on. [14] The more we know, the more we can learn. Therefore any effort to teach must be connected to the state of the learner, must provide a path into the subject for the learner based on that learner's previous knowledge. [15]

8. It takes time to learn: learning is not instantaneous. For significant learning we need to revisit ideas, ponder them try them out, play with them and use them. This cannot happen in the 5-10 minutes usually spent in a gallery (and certainly not in the few seconds usually spent contemplating a single museum object.) If you reflect on anything you have learned, you soon realize that it is the product of repeated exposure and thought. Even, or especially, moments of profound insight, can be traced back to longer periods of preparation.

9. Motivation is a key component in learning. Not only is it the case that motivation helps learning, it is essential for learning. This ideas of motivation as described here is broadly conceived to include an understanding of ways in which the knowledge can be used. Unless we know "the reasons why", we may not be very involved in using the knowledge that may be instilled in us. even by the most severe and direct teaching. [16]

The meaning of constructivism for museums

Having suggested these principles, I want to reflect on what they may mean for our specific day- to-day work both in mounting exhibits and in developing educational programs.

Points #1 and 3

Most museum educators have accepted the idea that learners need to be active, that in order to participate in learning we need to engage the learner in doing something, in hands-on involvement, in participatory exhibits and programs. But the more important point, I believe, is the idea that the actions which we develop for our audience engage the mind as well as the hand. Not all experiences are educative, as Dewey pointed out in *Experience and Education*. This does not mean that they necessarily have to be complex---but they do need to allow the participants to think as they act. I recently saw a videotape

of a group of children building a cardboard ramp which would serve as an inclined plane for an experiment they were to do. What the video tape showed was a fifteen-minute period in which the children spent time measuring, constructing (and wandering around) with little idea of what they were building or why they were building it. It was a hands-on activity that was not likely to be educative as intended for two reasons: a) The children had no chance to incorporate what they were doing into a larger picture: the focus was on completing a task, which for them must have appeared to be just one more of the senseless requirements of school. b) There was no opportunity to alter the task to fit the meaning-making of any individual student. They all simply measured strips of paper 24 inches long (the US is still not on the metric system) and 1.5" wide, everyone following the same recipe with no variation.

By way of contrast, I have watched adults look at a map of England at the dock where the Mayflower replica is berthed in Plymouth, Massachusetts. Repeatedly, adults will come to the map, look at it and then begin to discuss where their families come from. (I could imagine an even more elaborate exhibit at the same place which would include a map of the world and different ways in which people have immigrated to the US, so that all visitors could find something to interest them.) But at least for those who trace their roots back to England, here is an interactive exhibit (even if there is little to "do" except point and read) which allows each visitor to take something personal and meaningful from it and relate to the overall museum experience. For me, the Diaspora Museum in Tel Aviv came alive when I had the opportunity to call up family genealogies on the computer in the reference center. The opportunity to view and manipulate a library of family trees covering several generations and a wide geographical distribution, gave personal meaning to the idea of a Diaspora.

Physical involvement is a necessary condition for learning for children, and highly desirable for adults in many situations, but it is not sufficient. All hands-on activities must also pass the test of being minds-on---they must provide something to think about as well as something to touch.

Point #2

The idea that we learn to learn as we learn, that we begin to understand organizing principles as we use them, is not terribly radical to most of us, but I believe that there is an important manner of formulating it that can help us, which sometimes eludes us: What are we assuming about our visitors' ability to learn (to organize knowledge) when we present exhibits to them? What organizing schemes do we attribute to them, that may or may not be available to them? Let me give you an example. During the last year we have been observing visitors at the Boston Museum of Science interacting with a series of exhibits developed originally at the Exploratorium in San Francisco. We asked them what they thought of the exhibits. Some visitors did not have the tools they needed to get the concept of the exhibit. I don't mean that they did not understand the concept (that will be my next point) but that they did not have the organizing principles, and thus the learning tools.

For example, there are exhibits which require visitors to turn knobs which will cause a component of the exhibit to move or change. Not all visitors are clear about the relationship between the knob and what it does. The exhibit is intended to explain a causal relationship between two variables in nature; one variable is altered by turning the knob and that change then causes the other variable to respond and vary. But if the visitor does not understand about knobs and what they do, then the message of the exhibit cannot possibly be understood.

A similar issue concerns chronologies and time lines, which are common devices in history museums. Do we know that our visitors understand chronology? Are we positive that our visitors can appreciate a time line, for example, and can recognize that the distribution of dates in linear space may be intended to approximate their distribution in chronological time? There is considerable evidence that at least some visitors (i.e. children) cannot follow such reasoning; there is less evidence that any significant number of visitors can. [17] Maybe we need to teach our visitors to understand time lines through simple examples before we present them with complex charts that span thousands of years. Ayala Gordon discussed this issue when she pointed out that in order to allow children to experience a sense of time, the Youth Wing at the Israel Museum arranged exhibits so that children and parents would talk about changes in their lifetimes.

Points #4 and 5

Learning is a social activity. To what extent do we recognize that people learn as they speak and interact with each other? In evaluating an interactive exhibit at the Boston Museum of Science in which people could get information through a variety of modalities---they could read labels, listen to tapes, smell animal smells, touch animal mounts and manipulate interactive exhibit components-- -we noted that individual visitors preferred different learning modes. In family groups, the conversations became more democratic, and involved more members after all these modalities were installed, as family members shared, discussed and confirmed what each had learned while perusing his or her preferred modality.

We need to ask what have we build into the exhibit that encourages visitors to discuss, to share, to find out together. Has the architecture and exhibit arrangement encouraged discussion? Some art museums have a quiet air like a church, discouraging active debate and verbal interaction. The quiet may be appropriate for individual contemplation of pictures, but perhaps these museums could provide other rooms, close to the galleries, and fitted out with reproductions' reference materials or other reminders of the paintings, which would encourage dialogue.

Point #6

This is really an elaboration of the point made previously about learning to learn as one learns. Our visitors need "hooks"---connections---in exhibits to help them understand the messages intended. An experienced museum-goer or a person knowledgeable on a given subject can be enlightened easily. But what does it mean for a naive visitor to be confronted with a whole case containing may objects? Of what value is it to the naive visitor to be invited to push this button or read a sophisticated label?

It is important for exhibits to provide different kinds of entry points, using various sensory modes, different kinds of stimuli, to attract a wide range of learners. In teaching people to read, the use of different words which have powerful connections for individuals was dramatically described years ago by Sylvia Ashton-Warner18 and widely emulated since. Eurydice Retsila described a program in which children served as young ethnographers, developing individual projects of interest to them with the "assistance" of university students.

Point #7
Perhaps no other issue in constructivism raises more questions than the concern with finding the right level at which to engage the learner. Vigotsky spoke of the "zone of proximal development," [19]an unfortunately cumbersome term which refers to a level of understanding that is possible when a learner engages in a task with the help of a more expert peer (i.e. a teacher). People learn as they are stretched beyond their own knowledge but only within a range that is within their grasp given what knowledge and skills they bring to a task.

Point #8
Finally there is the issue of time to learn, time to reflect and time to revisit an idea. Museum educators have grappled with this problem and find it a particularly challenging one, since our audiences are free to come and go, and large fractions of them are tourists who many never return. Museum galleries are not designed as places to linger, despite our desire to have visitors spend more time there. I was impressed to note in the slide Michael Cassin showed yesterday that the National Gallery at the turn of the century had many chairs scattered around the gallery for people to sit in and contemplate the pictures. What do we do for the visitors who wish to stay with a topic longer? How have we organized our museums to accommodate them? To what extent have we provided additional resources (in addition to items which we are eager to sell to them in the nearby shop) that can satisfy the interested visitors' concerns that arise on the next day or a week after the visit?

I believe that an important issue for we, as museum educators is to tackle the problem of increasing the time possible for visitors to interact with our exhibits and reflect on them, revisit them (in the mind if not directly) and therefore internalize their messages to us.

Conclusion
The principles of constructivism, increasingly influential in the organization of classrooms and curricula in schools, can be applied to learning in museums. The principles appeal to our modern views of learning and knowledge but conflict with traditional museum practices. We need to reflect on our practice in order to apply these ideas to our work.

References
1 I will document this paper with quotes from relevant publications. See these for additional information on constructivism and its application in education. I have also

indicated how the views in this paper relate to a number of ether presentations at this conference.

2 "Constructivism asserts two main principles whose applications have far-reaching consequences for the study of cognitive development and learning as well as for the practice of teaching, psychotherapy, and interpersonal management in general. The two principles are (1) knowledge is mot passively received but actively built up by the experiential world, not the discovery of ontological reality." *International Encyclopedia of Education.* "Constructivism In Education," 1987.

3 The ideas I will discuss here have been touched upon by other speakers at this conference, for example Tomislav Sola in his general orientation; Samuel Sas stated that "in the modem Museum the visitor is at the center, not the object;" Maria Horta Baretto stressed that the meaning of an object is given to it by the viewer; and Yaron Ezrahi discussed the subjectivity of the images of science.

4 Every genuine experience has an active side which changes in some degree the objective conditions under which experiences are had. The difference between civilization and savagery to take an example on a large scale is found in the degree in which previous experiences have changed the objective conditions under which subsequent experiences take place." J. Dewey. *Experience and Education.* Kappa Delta Pi, 1938.

"If the view is adopted that 'knowledge' is the conceptual means to make sense of experience rather than the 'representation' of something that is supposed to lie beyond it, this shift of perspective brings with it an important corollary: the concepts and relations in terms of which we perceive and conceive the experiential world are necessarily generated by ourselves. In this sense we are responsible for the world we are experiencing." E. von Glaserfield. "An exposition of Constructivism: Why some like it radical" in R. B. Davis. C.A. Maher and N. Noddings, editors. *Constructivist Views of the Teaching and Learning of Mathematics.* Washington, D.C. National Council of Teachers of Mathematics, 1991.

5 As a participant stated in our discussion group, "History is made by people: it isn't a collection of facts." or as Avner Shalev stated "The role of education is not to instruct but tutorial: an approach that allows the visitor to be a consumer."

6 The meanings that learners construct do, in fact, concentrate on a limited number of conclusions. This is related to the notion that learning is social, as it happens within a culture, and perhaps for other reasons as well. A discussion of why certain views appear repeatedly is beyond the scope of this paper. That they do is evident when we consider, for example, the consistent Aristotelian" views in naive science explanations.

7 "Study is effectual in the degree in which the pupil realizes the place of the numerical truth he is dealing with in carrying to fruition activities in which he is concerned. This connection of an object and a topic with the promotion of an activity having a purpose is

the first and last word of a genuine theory of interest in education." J. Dewey. *Democracy and Education.* MacMillan, 1916.

8 "The most important message modern research on the nature of thinking is that the kinds of activities traditionally associated with thinking are not limited to advanced levels of development. Instead these activities are an intimate part of even elementary levels of reading, mathematics and other branches of learning." L.B. Resnick . *Learning to Think.* Washington, D.C.: National Academy Press.

9 "The object enters into dialog with the learner only after being transformed by him or her. In fact, it is the set of significant units organized by the learner and the relationships that he or she constructs between them that constitutes the cognitive object that, in turn, constitutes knowledge." A Henriques. "Experiments in Teaching," in E. Duckworth, J. Easley, D. Hawkins and A Henriques. *Science Education: A Minds On Approach to the Elementary Years.* Erlbaum, 1990.

10 "The relationship between thought and word is not a thing but a process. a continual movement back and forth from thought to word and from word to thought: .... thought is not merely expressed in words; it comes into existence through them." L.V. Vigotsky. *Thought and Language.* Cambridge, MA. MIT Press, 1962.

11 "Vigotsky was proposing that children's understanding is shaped not only through adaptive encounters with the physical world but through interactions between people in relation to the world---a world not merely physical and apprehended by the senses, but cultural, meaningful and significant, and made so primarily by language. Human knowledge and thought are themselves therefore fundamentally cultural, deriving their distinctive properties form the nature social activity, of language, discourse and other cultural forms." D. Edwards and N. Mercer. *Common Knowledge: The Development of Understanding in the Classroom.* London: Methuen, 1987.

12 As Mooly Broog stated in the discussion group "When you say Jerusalem, what is the visitor's concept? Each visitor, from a different community, has a totally different idea of what the city is."

13 "A fundamental way of changing the requirements for success on a particular task is to recontextualize the text presented to, and understood by, the learner. In all sample cases, the subject is initially presented with the activity---the whole task---embedded in, contextualized as part of some larger activity. For the subjects themselves, the recontextualization involves familiar scripts and human intentions." M. Cole and P. Griffin. *Contextual Factors in Education.* Madison, WI: Wisconsin Center for Educational Research, 1987.

14 Maria Baretto referred to this point when she stated that "we cannot identify and recognize what we don't already know ."

15 "We can learn most easily when we already know enough to have organizing schemas in L.B. Resnick and L.E Klopfer, editors. *Towards the Thinking Curriculum: Current Cognitive Research.* 1989 ASCD Yearbook. Alexandria, VA: American Association for Curriculum Development, 1989.

16 "Research... confirmed that acquiring skills and strategies, no matter how good one became at them, would not make one into a competent reader, writer, problem solver or thinker... The habit or disposition to use the skill and strategies, and the knowledge of when they are applied, needed to be developed as well." Resnick and Klopfer., op cit.

17 Increasingly we find that the limitations of timing described by Piaget extend longer into adulthood than Piaget would have had us believe. Research by Shayler and Adey suggests that English children shift from concrete to hypothetical-deductive later than Piaget argued; a considerable amount of research on college students indicates that many are still in concrete stages, and work with adults on science concepts often indicates that they hold "childish" views on a range of topics.

18 *Teacher.* New York. Simon & Schuster, 1963.

19 "...the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined by problem solving under adult guidance or in collaboration with more capable peers." L. Vigotsky. *Mind and Society.* Cambridge, MA: Harvard University Press, 1978.