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The Challenge of Understanding Radical Constructivism

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*To say "it is" is to grasp for permanence.
To say "it is not" is to adopt the view of nihilism.
Therefore a wise person
Does not say "exists" or "does not exist."
– Nagarjuna, Mulamadhyamakakarika,
2nd century C.E. (Garfield 1995, Chapter 15:10)*

To honestly agree or disagree with someone's position, one must first understand that person's position. Only then can one really decide about the other person's position.

Many people have expressed disagreement with von Glasersfeld's notion of radical constructivism.¹ The list of references to the expressions of disagreement in print is very large. In addition there are probably gigabytes of such expressions on-line. Much of the debate has been on a philosophical level, removed at least somewhat from application.² But some have gone so far as to claim that radical constructivism is dangerous when applied to education.³

Most, if not all, of these lines of disagreement with radical constructivism have one aspect in common. They are expositions of how radical constructivism contains contradictions with the basic premises of realism. Unfortunately, this common thread is not acknowledged.

A fundamental difference

The basic position of radical constructivism is fundamentally incommensurate with that of realism. Von Glasersfeld (1999a, [13]) puts forth the essential difference:

"What differentiates radical constructivism from the tradition, is the proposal unequivocally to give up the notion that knowledge ought to be a veridical 'representation' of a world as it 'exists' prior to being experienced (that is, ontological reality)."

Purpose: This contribution to the Festschrift honoring Ernst von Glasersfeld gives some insight into the perpetual problem of understanding radical constructivism (RC). Parallels with the Middle Way school of Buddhism appear to shed light on this challenge.

Conclusions: The hegemony realism has over the thinking of even the most highly educated in our civilization plays a major role in their failure to understand RC. Those still subject to realism in their thinking interpret statements by those in RC in ways incompatible with RC. Until realists disequilibrate over mismatches between realist expectations and experiences, no alternative way of thinking is accessible to them and misinterpretations of RC will continue. **Practical implications:** While we cannot change someone else's understanding, in our interactions with them we can focus on creating situations in which those who do not understand us might disequilibrate. If we are successful, they are likely to begin to escape the domination of realism in their thinking.

Value: This insight may enable eventual success in our assisting others to understand RC.

Key words: Realism, Buddhism, disequilibrium.

Coming from a different experience, history and philosophy of physics, Max Jammer (1957, p. 2) seems to be referring to the same thing when in the middle of the last century he wrote:

"As a result of modern research in physics, the ambition and hope, still cherished by most authorities of the last century, that physical science could offer a photographic picture and true image of reality had to be abandoned."

Still, the realist position is alive and well in physics, as evidenced by this comment from de la Torre and Zamorano (2001, p. 103):

"...we postulate the objective existence of physical reality that can be known to our minds... with an ever growing precision by the subtle play of theory and experiment."

It appears that a consequence of the realist position is: everything is ultimately about the truth, which can be known. Furthermore, in realism, when comparing two statements about the world it must be possible to determine which is closer to the truth. On the other hand, in radical constructivism, truth is not the point because such truth is not accessible. In radical constructivism our ways of knowing do not access such truth. Hence, the two positions could hardly be more different.

The problem with the debates about radical constructivism

The issue of initial assumptions

Every position, paradigm or ideology that describes the nature of human knowing is based on its own particular set of initial assumptions. Initial assumptions are at best taken on belief and fit with experience.⁴ It appears the initial assumptions of a culture are uncritically adopted as an implicit part of one's milieu by those less careful or thoughtful. Initial assumptions cannot be known to be true. They cannot be proved.

If one discovers an initial assumption does not fit experience, then the logical structure built on this assumption is at least suspect, if not demolished. No challenges to radical constructivism seem to explore this avenue.

Initial assumptions are usually very hard, if not impossible, to test. Even if one were to come to understand another view and its initial assumptions, understanding the initial assumptions generally reveals how well they too fit experience.⁵ In the end we come back to the realization that to choose a set of initial

assumptions from which to operate is either an act of faith or an arbitrary decision.

The standards of logic

Each paradigm generally operates by the rules of logical operations agreed upon by all across paradigms.⁶ The structures and conclusions of each paradigm are merely the proper results of these logical operations starting from a particular set of initial assumptions. For this reason the structures and conclusions of one paradigm cannot be expected to be consistent with another paradigm based on different initial assumptions.

These things being the case, the structures and conclusions from a paradigm can only be judged faulty or incorrect, if it can be demonstrated that there is an error in logic at some point after the initial assumptions, that faulty data have been used or that the conclusions do not fit experience. A claim that a conclusion from one paradigm is false because it does not fit another paradigm is trivial and *non-sequitur*. Conclusions from within a particular paradigm are not intended to apply to another paradigm and cannot logically be required to apply to that other paradigm's different set of initial assumptions. It is important to note that since such conclusions are intended to fit experience, another paradigm with different initial assumptions may indeed have an entirely different conclusion to fit the same experience. Both sets of conclusions are equally valid, each in their own paradigm.

Sadly, few, if any, of the arguments offered in the many publications and gigabytes of on-line discussion attempt to point out an error in logic from the basic premise of radical constructivism or from faulty data. They all make the strategic blunder of pointing out errors in radical constructivism as if it must be commensurate with realism. Hence, much effort has been expended in this program to prove radical constructivism wrong, but to no avail.

There are two problems with this strategy. One, as has been pointed out, is the logical error that conclusions must be universally applicable instead of dependent on the initial assumptions from which they are derived. The other is that such lines of reasoning reveal that their architects are not operating from the initial assumptions of radical constructivism. Such arguments are not likely to impress the thoughtful observer of such debates, let alone change someone's mind.

To challenge a view

Observing then that thoughtful people work diligently and carefully to reason appropriately from initial assumptions and that the initial assumptions too are subjected to intense scrutiny to check how well they fit experience, how can one judge a paradigm? Beyond previous experience, the only way is to test its usefulness. Do the predictions made from it fit experience? Can it be used to successfully accomplish desirable goals? As von Glasersfeld (1999a, [3]) has put it:

"Ultimately, of course, a way of thinking must not only be claimed feasible but, in order to become attractive, its advantages must be shown in action."

We shall come back to some evidence of the usefulness of radical constructivism later in this piece.

Evidence of the logical error: An example

Consider an example illustrating the logical errors made by realists attempting to prove radical constructivism wrong, useless or dangerous. The point in bringing up this example and commentary is not to demonstrate the superiority of one view over another, but the logical errors typically made in such arguments.

One can see the persistence of realist assumptions in the following comment by Owen (1999, [4]) in response to von Glasersfeld's paper (1999a).⁷ (Sentences have been numbered in arabic numerals surrounded by curled brackets to facilitate reference in the following analysis.)

"{1} The Archimedian predicament above is joined by the much-discussed paradoxicality when radical constructivism tries to observe itself and construct a theoretical similitude of itself that can be {i} selected as the most 'efficient' among others by means of a criterion of judgment that is likewise selected in a non-arbitrary manner, while {ii} avoiding the appearance of violating its own Canon of the subjectivity of efficiency or utility. {2} How can a Doctrine of the Subjectivity of 'Knowledge' describe itself in generally valid terms? {3} After all, we cannot claim that the Doctrine of radical constructivism

is a prior principle or schematum for the synthetic understanding of itself. {4} I falter here, as Kant did: I am seeking to make objectively valid statements about a document that specifies such statements are logically undecidable. {5} One is discouraged from doing the heavy lifting required here when no matter how intellectually conscientious one is, the reduction to 'a mere matter of personal opinion' cannot be logically defeated. {6} Or the retort, 'Well, if radical constructivism works for you, that's fine!' {7} No matter what radical constructivism officially states, its originators were seeking epistemological 'Truth.'⁸

In the rather long sentence {1} two attributes of radical constructivism deemed incompatible are presented. Attribute {i} refers to a desire for radical constructivism to be "most 'efficient' among others by means of a criterion of judgment that is ... selected in a non-arbitrary manner." Of course, it would be "violating its own Canon of the subjectivity of...utility," (attribute {ii}) if it were to attempt to demonstrate it is the most superior by non-arbitrary criteria of judgment. Stated this way there does appear to be a paradox. But, in radical constructivism, one would neither claim to have the most efficient explanation or theory nor that there could be non-arbitrary criteria of judgment. One might claim that an explanation fits or enables one to be effective at something, but having the most efficient explanation is not required. We can never prove there is not another "more efficient" explanation out there. Nonetheless, to be effective or even apparently more effective, does no more than to suggest a degree of fit with experience.

Sentences {2} & {3} explicitly reveal the belief that the goal of radical constructivism is validity. That Owen wrote to this effect is evidence that his thinking about radical constructivism is subject to realist criteria. Certainly, if by validity one means truth, or closer proximity to truth, then this is neither the goal nor the claim of radical constructivism.

The intent expressed in sentence {4} is to make "objectively valid statements." This is a realist goal, not a radical constructivist goal. In sentences {5} & {6} the dilemma presented is the conflict between the desire to logically

defeat something that does not yield to such methods. Apparently, intellectual “heavy lifting” is only rewarded by achieving the goal of logically disproving something or at least the possibility of logically disproving something. Finally, in sentence {7} is the claim that radical constructivist adherents are really “seeking epistemological ‘Truth,’” in spite of what is stated explicitly in the article Owen is commenting upon. It seems clear, at least from these words, that the realist view is most consistent with the desired methods and goals: that thinking and logic can enable us to prove which of two positions is closer to a veridical picture of reality. Again, apparently, the point is to come to a true picture of reality, which can be arrived at through our mental efforts.⁹

We see similar evidence that truth is the be all and end all in determining value in scientific explanation among critics of radical constructivism in the writing of Matthews (1998, p. 5):

“There is a not-too-subtle difference between the constructivist formulation ‘making sense,’ and the realist formulation ‘finding out.’ The former has no epistemological or referential bite; the latter has both. Things can make perfect sense without being true; and making still more sense does not imply any increase in truth content.”

... and from Kragh (1998, p. 129):

“The epistemology characteristic of constructivists is either relativistic or agnostic, in the sense that they do not admit any distinction between true and false accounts of nature.... Denying the existence of an objective nature, or declaring it without interest, scientists’ accounts are all there is, and it is with these accounts the constructivist sociologist is solely concerned. How, then, do scientists manage to produce their results and build up a corpus of consensual knowledge about what they call nature?”

In these two passages there seems to be the implicit expectation that the sense made by mere students is extremely unlikely to resemble what scientists decided before. This suggests a belief about human nature, e.g., that most people are not capable of making the same sense of phenomena that scientists have in the past. Apparently, in this view, scientists are the few special peo-

ple who can make proper sense of the phenomena.

Both authors do seem to be able to give accurate descriptions of these facets of radical constructivism, but just as they are clear in their descriptions, they clearly fail to recognize the logical error of expecting radical constructivism to be consistent with the initial assumptions it has discarded: those of realism.¹⁰ This does not make radical constructivism right, but it renders the arguments of these authors invalid. From the radical constructivist position, attempting to make such arguments is inappropriate.

Where did these non-radical constructivist notions come from? The most likely origin could be the realism so prevalent in western culture. This realism is pervasive in our culture and there is little or no exposure to an alternative experienced by most of society. It goes unexamined by most members of the culture. The realist origins of the oft-described difficulties are even more plausible when one takes a critical look at many such passages on difficulties with radical constructivism. Owen clearly expresses disbelief in the words of the article on which he is commenting. In paragraph 52 of von Glasersfeld’s article (1999a) we find the following:

“The value of the constructivist model – and I emphasize once more that radical constructivism makes no ontological claims and is intended as no more, but also no less, than a useful model of knowledge and the activity of knowing – will have to be determined by its application to basic problems we run into in the construction of our experiential worlds.”

It appears then that one major challenge, possibly *the* major challenge, in understanding radical constructivism is the pervasive, implicit grounding we all have in realism from our culture and our own nature. Until one gets past this hurdle, one cannot be described as understanding radical constructivism. Throughout the discussions, arguments and debates concerning radical constructivism, reference to Truth maintains its presence as revealed by the words of very intelligent, sincere detractors. This is evidence of the difficulty of letting go of realist criteria, which are not part of radical constructivism. Such criteria are unnecessary and counter productive in radical constructivism.

A possible parallel with Buddhist thought

There are probably readers of these words more conversant with Buddhism¹¹ than the author, but it appears that there is a school of thought in Buddhism that arrived at ideas similar to those in radical constructivism, albeit by a different path.¹² It has been explained that these schools of thought are to be considered a sequence one moves through or can move through in thinking about the nature of what we know and how we know it.¹³ The final school of thought is called the Middle Way. An expression of the Middle Way is the opening passage by Nagarjuna. The Middle Way appears to have encountered and continues to encounter challenges very similar to those faced by radical constructivism. What light might this shed on the challenges mounted against radical constructivism?

The central idea in the Middle Way when first translated into English was referred to as “emptiness.” This word is still used in the literature. What it refers to is the notion that when we attempt to go beyond the conventional existence of anything, we find no ultimate essence. The consequence is that the conventional existence of something has a beginning, middle and end. For Buddhists this is characteristic of the world we know. This beginning, middle, and end, sometimes put as arising, existing, ceasing, applies also to what we think things are – all things: objects, ideas, etc. Thus conventional existence is an expression of emptiness. Von Glasersfeld (1999b, [6]) appears to have intended something similar when he wrote:

“Considered as a proposed way of thinking and not as a description of the way things are, the question to ask about the constructivist model is simply: does it give a viable account of the knowledge I rely on in my actual living. I obviously believe it does – but this in no way denies the possibility that tomorrow or the next day a more elegant or effective model might be constructed.”

Without ultimate essence there is no veridical picture of essential or ultimate reality. Any current viable account of experience that exists now, arose and we can expect it to be discarded at some point in the future for another viable account that we consider more useful at that point.

A text on the Middle Way was written by the Buddhist scholar, Nagarjuna, in the second century C. E. This text is still studied by Buddhist scholars today. In it Nagarjuna explains and defends the Middle Way in verse form. The book from which the opening translation was taken includes a very interesting and useful commentary. What is considered to describe the Middle Way in a nutshell is Chapter 24, verse 18 (Garfield 1995):

“Whatever is dependently co-arisen
That is explained to be emptiness.
That, being a dependent designation,
Is itself the middle way.”

It appears that what is meant here is that the impermanence of everything we know conventionally means that everything we know conventionally lacks ultimate essence; it is empty. Any essence we might perceive is our own imputation, human construction. In addition the designation “empty” is itself empty; hence, emptiness is empty of ultimate essence, also. This notion that emptiness itself is empty seems to be very similar to a claim repeated by radical constructivists (Glaserfeld 1999a, [4]):

“I would be contradicting one of the basic principles of my own theory if I were to claim that the constructivist approach provides a true description of an objective state of affairs.”

Challenges to the Middle Way come from essentialism in its various forms. Essentialism entails the notion that the ultimate essence of something exists and can be known. A consequence of this ultimate essence of something is permanence, hence it does not arise nor does it cease and it can have no cause either to arise or to cease. There are two extremes in essentialism. In the case of the reification of the phenomenal world then emptiness (dependence) cannot exist, but ultimate essence does. In the case of the reification of emptiness, nihilism, the phenomenal world cannot exist, hence the ultimate essence of the phenomenal world is permanent non-existence. These two extremes in essentialism seem to be realism and solipsism, respectively. Either physical reality exists or it does not. If it exists, then we can work on knowing it better and better. The only other option in essentialism is non-existence.

The nature of the responses Nagarjuna makes to challenges to the Middle Way become evident when one reads the commen-

tary. Repeatedly he shows how positions involving either extreme of essentialism, lead to contradiction. The only way to avoid these contradictions is to avoid the extremes of essentialism. Avoiding the contradictions enables one to be consistent with the fundamental Buddhist tenets.¹⁴ This middle path then holds emptiness, as well as all of the phenomenal world, as empty.

Every challenge to the Middle Way is effectively countered by Nagarjuna in essentially this same way. The many examples of Nagarjuna’s counters to the challenges suggest that the chief challenge to understanding the Middle Way has its origins in not being able to step outside of essentialism, *i.e.*, realism. Hence, even in cultures considered to be majority Buddhist, the notion of the Middle Way was misunderstood, apparently in a way very similar to the misunderstanding of radical constructivism.

This may help us to understand better our own situation in which so many seem to misunderstand radical constructivism. Even in a setting in which a similar philosophical position is officially sanctioned, there is resistance of the same sort. Apparently the situation is not simply a matter of our realist culture but of something deeper in the human experience and functioning.¹⁵

What can we do?

Considering possible responses to the challenge of understanding radical constructivism, we need to keep in mind important features of radical constructivism:

1. Meaning exists only in the mind, hence it cannot be transmitted (Glaserfeld, in press)
2. The only person who can make new understanding for a person is that person.
3. In the case of communication, meaning can be negotiated, but at best we can only *take* this negotiated meaning *as shared*.
4. Meaning or understanding is formulated to fit experience, and so revised when needed.

The consequence of these features of radical constructivism is that we should strive to emulate von Glaserfeld (1999b, [1]) – as he explained:

“I entered the fray neither to preach nor to convince, but in the hope of being criti-

cized in a way that might push me to think and above all to express my thoughts more clearly.”

Certainly, given the number of recurrences of application of realist criteria to radical constructivism and the number of responses to these misapplications in different words and different contexts, it appears that there is no magic bullet, no set of words that can be used to avoid initial misunderstanding of what is intended by radical constructivism.¹⁶ The results of von Glaserfeld’s eloquence over many years now support this contention. The process of constructing a new understanding is a process, not something that can be handed out to anyone who will read or listen. Similarly, the practitioners of the Buddhist Madhyamaka (Middle Way) philosophy point out that a crucial feature is meditative praxis that enables the experience of the emptiness of all phenomena. This significance of process in knowing, both on the part of radical constructivism and of the Buddhist Middle Way, is in stark contrast with the realism that dominates Western philosophy and science with the focus on final product.

Disequilibrium as central to change in understanding

The problem of realists understanding radical constructivism is analogous to that in science education (Dykstra 2005). Those teaching science usually have significantly different understandings of the phenomena than their students. This has been known for some time and is well documented (Duit 2006). Much effort has been expended by many very diligent, sincere, intelligent instructors, yet the outcome is most students leave with the same understanding of the phenomena they came with, new terms notwithstanding. Meaning was not transmitted to the students (Duit 2006). Of course, this negative result has to be explained. The realist adopts the elitist doctrine that only a few special students can properly receive what has been transmitted. radical constructivism offers an alternative.

If meaning cannot be transmitted, then is instruction for all a hopeless cause? It appears that attempts to transmit meaning in science

instruction generally fail. To attempt to transmit something entails something that can be transmitted. In realism this meaning, often called knowledge, is assumed to have this property. That the attempt to transmit “science knowledge” is such a spectacular failure in science education suggests a substantial failure of the realist program to fit experience.

An alternative exists to this dismal prospect. The Swiss Genetic Epistemologist, Jean Piaget, and his colleagues studied the thinking of children and students for more than 60 years. This work focused not on what happens in school, but on what appears to be happening in the minds of young human beings. Piaget and his co-workers developed an explanatory model for the developmental processes they observed in many students (Piaget 1985). Human beings establish and maintain equilibrium between their conceptions of their world and their experiences in their world. When they perceive disequilibrium, they move to re-establish equilibrium. This can happen in either of two ways. The offending experience can be ignored or avoided, swept under the carpet, so to speak. On the other hand, conceptions of the world can be changed such that the offending experience no longer offends.

In this model, human beings are constantly experiencing their world. There is a constant, not always conscious, checking of these experiences against expectations based on existing explanatory schemes. As long as experiences are consistent with existing explanatory conceptions, these experiences reinforce those conceptions. It should be noted that a significant part of this process is the selective ignoring of certain differences that in the applicable conception are deemed unimportant. This processing of experience that matches or fits existing explanatory conceptions is called by Piaget “assimilation.” Under these conditions, existing explanations account for experience, hence there is neither need nor motivation to revise or devise new explanatory conceptions. There is equilibrium between experience and existing explanation.

When experience is encountered that is perceived not to fit existing explanation and this mismatch cannot be ignored, a state of disequilibrium between explanation and experience is experienced. Once avoidance is not an option, then a process of self-regula-

tion is initiated and existing explanation is modified and tested until the new or modified explanation fits these new experiences. An accommodation is developed. The disequilibrium can be minor or monumental. Either way the new explanation fits experience better than the previously existing explanatory conceptions.

If one wishes to engage someone in developing new understanding, disequilibrium is key. This is central for any teacher who wishes students to leave the instructional setting with new understanding. The teacher needs to understand the students’ thinking about a phenomenon. With this understanding in mind, the teacher needs to search for examples of experience with the phenomenon that do not fit the students’ thinking. Having picked an example, to maximize the chances that students disequilibrate, the teacher will engage the students in making and explaining predictions about the example. This engages commitment to the explanation by the students and makes explicit features of their explanatory conceptions. The prediction sets up a test of their explanations. If the teacher has developed a sufficient understanding of the students’ understandings, then when they experience the example experience, they will not be able to assimilate it. Disequilibrium is the result. If the teacher has not developed a sufficient understanding of the students’ understandings, then they will be able to assimilate the new experience. Disequilibrium does not occur and no change in existing explanations will be necessary. Even though the students do not change their understandings, the event provides evidence for the teacher to develop a better understanding of the students’ understandings.

If, in the classroom, it is safe for their predictions to be found not fitting their explanations, then it is safe to speculate about and test alternative explanations, on the evidence of the new experience. These alternative explanations can be tested. This process of elicitation of explanatory conceptions, comparing these conceptions with experience, and resolving discrepancies can be cycled over additional experiences that do not fit explanation at each cycle. The result is always explanatory conceptions that fit more experience and usually fit more closely.

Dykstra (2005) shares data in evidence that change in understanding the phenomena

can be the result of this approach to instruction. On established diagnostics of students’ conceptions, course averages for non-science majors routinely change by four or five times the amount the class averages change for science and engineering majors that experience conventional instruction on the same topics. The large change in understanding is not just achieved by a few special students, but essentially by all who are willing to participate in the process.¹⁷ The instruction described is pursued with the goal of engaging students in examining and testing their own sense of the phenomena. This is in contrast to typical instruction in which the activity has the exclusive goal of transmitting the knowledge to the students by telling and showing them.

The structure of the canonical knowledge does not drive this instruction. Instead, the students’ understanding and the experiences it can be applied to drive the instruction. It is not a focus on the phenomena, nor is it an

ABOUT THE AUTHOR

Dewey I. Dykstra, Jr., currently a Professor of Physics at Boise State University in Boise, ID, USA, began his interest in science by reading science fiction in grade 3. Active in science fairs through the middle and high school grades in Maryland, at Case Institute of Technology in Cleveland, OH he earned a B. S. in Physics in 1969. For three years he taught Physics and Physical Science at East Technical High School in Cleveland, OH and the next year 9th grade Physical Science and senior Physics at Middletown High School in Middletown, MD. While earning a Ph. D. in condensed matter Physics at The University of Texas at Austin, he stumbled upon a description of the work of Jean Piaget and its applications to thinking about physics learning. On the Physics faculty at Oklahoma State University and at Boise State University, Dykstra’s work has focused on understanding the nature of understanding physical phenomena and how, why, and under what circumstances this understanding appears to change. Having heard of constructivism already from others, he was not exposed to the writing of Ernst von Glasersfeld until 1989. Since then, Ernst has been a valued mentor. Dykstra sometimes finds time to play bagpipes.

attempt to guess what scientists figured out in the past. It is a focus by the students on their own understanding and testing it carefully against experience with the phenomena. In other words, it is the process that makes the changes in understanding possible.

Disequilibration: Key to breaking the bonds of realism

If this approach to education can shed any light on engaging people in constructing an understanding of radical constructivism, it seems to be in inducing disequilibration. One cannot disequilibrate someone else, but one can create settings in which people are more likely to disequilibrate themselves. The effort to accomplish this induction of disequilibration must be understood as a process. We do not have the luxury of having an impartial third entity, such as some physical phenomenon to check against. Consequently, all we have to share is our words and the gestures we make. The only experience another has to work with to test their explanation of what we are talking about is experience with our words

and gestures. Just as experience with a physical phenomenon neither conveys nor proves the truth of an explanation, our words and gestures do not convey or prove meaning to someone else. In the case of radical constructivism the process is more complicated and requires more time than the phenomena of introductory physics.¹⁸

It is necessary in our interactions with realists that we recognize they do not realize we are working with a profoundly different set of initial assumptions. Society is set up by realists to be compatible with their view. They will work very hard at interpreting what we say in their terms. They cannot “hear” what we are saying in our own terms, because they have yet to construct the requisite ideas. Before they begin to develop another way of thinking, they have to disequilibrate. We have to calculate to say and do things, to bring their attention to things that do not fit their realist explanations of their world, i.e., things that do not make sense to them. We run the risk of their concluding we are deluded or misled. This is the equivalent of sweeping the experience, and us, under the carpet. On the other hand, there will be some who draw near to the discrepancy they perceive and begin to develop new conceptions in interactions with

us. We cannot afford to let the risk of being written off deter us from our efforts to induce disequilibration. Without disequilibration, no change in understanding happens.

It should be clear that this process requires patience. We see this in Ernst von Glasersfeld’s approach. For many his calm and patient demeanor, coupled with his willingness to interact, have provided necessary ingredients to enable us to construct our understandings of radical constructivism. We can only hope to emulate him in our own efforts to help others understand.

Thank you Ernst for engaging with us in constructing our own new understandings, for being our mentor.

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Notes

1. For the reader who is not familiar with radical constructivism there are two sources that serve as good starting points for making sense of radical constructivism. The shorter of these two is the article *Knowing without metaphysics* (Glaserfeld 1999a). The article is accessible on-line. A more extensive description is in the book *Radical constructivism: A way of knowing and learning* (Glaserfeld 1995).
2. A few examples: Bickhard (1995); Phillips (2000); Suchting (1992).
3. For example: Matthews (2000); Kragh (1998); Nola (1998).
4. Since the objects of interest here are paradigms concerning the explanation of experience, any paradigm whose initial assumptions do not fit experience will have a hard time surviving the need for fit

to experience. “Being explained” entails fit between explanation and that which is to be explained. Since the attempt is to explain experience, it is not an assumption that initial assumptions in a paradigm must fit experience. It is a consequence of the belief that experience can be explained. Fitting experience is the point of the process. An explanation that does not fit would neither be viable nor an explanation. This is not uniquely Piagetian. It is fundamental to the process of any attempt to explain a specified set of experiences from any paradigm. It is certainly the basis of science.

5. It is important to keep in mind the difference between understanding a view and accepting that view.
6. By “logic” and “logical operations” I mean to distinguish initial assumptions, descriptions of experience and conclusions

from the logical operations used to derive conclusions from the assumptions and descriptions of experience. The logical operations are in the “if... then...” and the “because...” parts of explanation.

7. This passage is reproduced exactly as it appears on-line. The only thing changed is the font and font size.
8. It should be noted that in the case of this particular author, reading the note in its entirety reveals the author is working on making sense of radical constructivism. This is relatively rare. Most negative publications about radical constructivism are attempts to disprove it, not understand it.
9. Allan Wallace (2006, personal communication) suggests: “The fundamental question as I see it is: are you seeking to understand reality as it exists independently of perceptual experience and thought? Or are you seeking to understand

the world of experience (Lebenswelt), which does not exist independently of percepts and concepts? Philosophical realists are concerned with the former, whereas Buddhists (especially Madhyamikas [Middle Way adherents]) are concerned with the latter.” In radical constructivism the position is that our experiential reality is all we can access. We have no way to access something that might be independent of perceptual experience and thought. This suggests a certain similarity between the positions of Buddhism and radical constructivism in contrast to realism.

10. One should note that Riegler (2001) shows how one can understand science from a radical constructivist point of view. Of course, the drive to find truth is not part of this way of understanding science.
11. Others associated with radical constructivism have explored connections between Buddhist thought and radical constructivism. The interested reader should consult Varela, Thompson & Rosch (1991). In the present piece the point is not primarily the similarities between the two philosophies, but that both have faced analogous onslaughts from defenders of realism.

12. It is the case that Buddhism practices similar ideals to those of radical constructivism. In particular both are based on the extent to which they fit experience. This is one of many differences in Buddhism from religions we in the west are generally familiar with. The consequence is that Buddhist philosophy evolves as does our understanding in radical constructivism.

13. This explanation of the relationship between these philosophical schools was given in verbal interaction by Geshe Lhakdor, Director of the Library of Tibetan Works and Archives, Dharamsalla, India, December, 2005.

14. The Four Noble Truths in Buddhism and their implications serve as the foundation on which Buddhism and its philosophy are built. They are: (1) All life in cyclic existence is suffering. (2) There is a cause of this suffering, namely, craving caused by ignorance. (3) There is a release from suffering. (4) The path to that release is the eightfold Buddhist path of Right View, Right Understanding, Right Speech, Right Action, Right Livelihood, Right Effort, Right Mindfulness and Right Concentration (Garfield 1995, p. 294). The order in

this list of the eightfold path has been adjusted to conform to the standard in Tibetan Buddhism.

15. One wonders with access to cinema premises, such as that in *The Matrix*, and access to virtual reality, if there is the slow evolution of culture beyond realism. Sadly, many young people seem more interested in material gain. In this context it appears *The Matrix* is still science fiction, with the emphasis on fiction.
16. The typical conclusion first jumped to about radical constructivism while still rooted in realist foundations is that radical constructivism is nothing more than the absurd assertion of solipsism.
17. The elitist notion implied in the realist criticism by their assumption that mere students making sense about phenomena cannot lead to what scientists have decided is without merit in the light of this data.
18. The shift from the goal of students “getting” the distilled wisdom transmitted to engaging students in making sense of their experiences seems similar to Piet Hut’s (2003) reference to “goal-as-path” forms of Buddhism in contrast to what might be goal-as-result forms.

References

- Bickhard, M. H. (1995) World mirroring versus world making: There’s gotta be a better way. In: Steffe, L. P. & Gale, J. (eds) *Constructivism in education*. Lawrence Erlbaum Associates: Hillsdale NJ, pp. 229–267.
- de la Torre, A. C. & Zamorano, R. (2001) Answer to question #31. Does any piece of mathematics exist for which there is no application whatsoever in physics? *American Journal of Physics* 69(2): 103.
- Duit, R. (2006) Students’ and teachers’ conceptions in science: A bibliography. Retrieved from <http://www.ipn.uni-kiel.de/aktuell/stcse/stcse.html> on 29 January 2007.
- Dykstra, D. I. Jr. (2005) Against realist instruction: Superficial success masking catastrophic failure and an alternative. *Constructivist Foundations* 1(1): 40–60.
- Garfield, J. L. (1995) *The Fundamental Wisdom of the Middle Way: Nagarjuna’s Mulamadhyamakakarika*. Oxford University Press: New York.
- Glaserfeld, E. von (1995) *Radical constructivism: A way of knowing and learning*. Falmer Press: London.
- Glaserfeld, E. von (1999a) Knowing without metaphysics: Aspects of the radical constructivist position. *Karl Jaspers Forum Target Article 17*. Retrieved from <http://www.kjf.ca/17-TAGLA.htm> on 11 September 2006. Originally published in 1991 in: Steier, F. (ed.) *Research and reflexivity (Inquiries into Social Construction)*. Sage Publications: London, pp. 12–29.
- Glaserfeld, E. von (1999b) Construction in religion and art. Response 5 to commentary 5 by G. Morgenstern to Karl Jaspers Forum Target Article 17. Retrieved from <http://www.kjf.ca/17-R5MOR.htm> on 12 September 2006.
- Glaserfeld, E. von (in press) The constructivist view of communication. Presented at the 2003 Memorial Meeting for Heinz von Foerster, Vienna. Retrieved from <http://www.vonglaserfeld.com> on 5 March 2007.
- Hut, P. (2003) Conclusion: Life as a laboratory. In: Wallace, B. A. (ed.) *Buddhism as science*. Columbia University Press: New York, pp. 399–416.
- Jammer, M. (1957) *Concepts of force*. Harvard University Press: Cambridge MA. Republished in 1999 by Dover Publications: Mineola NY.
- Kragh, H. (1998) Social constructivism, the gospel of science, and the teaching of physics. In: Matthews, M. R. (ed) *Constructivism in science education*. Kluwer Academic Publishers: Norwell MA, pp. 125–138.
- Matthews, M. R. (1998) Introductory comments on philosophy and constructivism in science education. In: Matthews, M. R. (ed) *Constructivism in science education*. Kluwer Academic Publishers: Norwell MA, pp. 1–10.
- Matthews, M. R. (2000) Appraising constructivism in science and mathematics education.



tion. In: Phillips, D. C. (ed.) *Constructivism in education: Opinions and second opinions on controversial issues*. National Society for the Study of Education: Chicago, pp. 161–192.

Nola, R. (1998) *Constructivism in science and in science education: A philosophical critique*. In: Matthews, M. R. (ed.) *Constructivism in science education: A philosophical examination*. Kluwer Academic Publishers: Norwell MA, pp. 31–60.

Owen, R. (1999) Difficulties with constructivism. Commentary 24 to Karl Jaspers Forum Target Article 17. Retrieved from <http://www.kjf.ca/17-C24OW.htm> on 11 September 2006.

Phillips, D. C. (2000) An opinionated account of the constructivist landscape. In: Phillips, D. C. (ed.) *Con-*

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structivism in education: Opinions and second opinions on controversial issues. National Society for the Study of Education: Chicago, pp. 1–16. (See also the Editor's Introduction to each section of the book).

Piaget, J. (1985) *The equilibration of cognitive structures: The central problem of intellectual development*. Chicago: University of Chicago Press.

Riegler, A. (2001) Towards a radical constructivist understanding of science. *Foundations of Science* 6 (1–3): 1–30.

Suchting, W. A. (1992) *Constructivism deconstructed*. *Science and Education* 1(3): 223–254.

Varela, F., Thompson, E. & Rosch, E. (1991) *The embodied mind: Cognitive science and human experience*. MIT Press: Cambridge MA.

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