

REPLY

## It's life Jim, but not as we know it, not as we know it

Johanne McComish

Valda Kirkwood's response to my article illustrates how connections operating at the grass roots level of the individual can overcome barriers and lead to changes.

However, my argument in my original article, and again here, is that this is important, but not enough. The purpose of feminists, and those interested in gender issues, is to change what we now have. As I see it, science is masculinist and eurocentric in spite of its claims to be universal and culture-free. The goal for feminists must be to move towards resolving that contradiction in some way.

It seems that Valda Kirkwood does not see the problem in this light. She is a feminist, and she does want change. She sees science as a way of knowing about and living in the world, as yet another pair of spectacles to be put on to interpret the world, as something which will be demystified if you have the skills to access scientific spheres of knowledge. I agree that for many practical purposes we must continue to live within the parameters of this vision of science. Within those parameters, the making of connections which she writes about will lead to some changes. More people will be able to engage with science in various ways. The teaching will be different, and more inclusive. Gender bias will be less pervasive. However, the changes will go no further than the parameters of her vision of science allow. This vision does not problematise the nature of our science, nor the nature of the individuals we become in a scientific world.

I was tempted to say that it is a matter of opinion, ultimately of personal preference, whether you view science as another pair of spectacles to put on or off at will, or whether you view it as *the* gendered lens through which we are all culturally bound to look. However, I feel I must take a stronger position and claim that the latter view is a great deal more convincing. It has been very thoroughly explored in theoretical writings, in practice there are very many issues which surface regularly which cannot be explained from the first perspective, and it is these and similar practical issues which generated the theoretical questions in the first place.

At the very least, the existence of such a well developed alternative view poses a challenge to present constructivist thinking such as Valda Kirkwood's. It demands that the questions it generates are faced up to in constructivist thought. This cannot happen at the level of individual connections. It must involve extensive interrogation of the assumptions and theoretical models which sustain our world and our everyday practices. Science is a complex theoretical system. Without an equally complex theoretical rethinking of its place in us, as human individuals, and our culture, science will not change and science learning will continue to be profoundly masculine at its heart.

I wish to respond to Valda Kirkwood first by commenting in her own terms on three of her main emphases - the importance of the individual, the integration of theory-research-praxis, and the general notion of synthesis and connectedness. Secondly, I want to respond briefly by shifting the terms into a different paradigm.

## The individual

Valda Kirkwood's response to my article focuses, as does constructivism, on the personal learning experiences of the individual learner, and on their interactions with the here and now, with day-to-day reality. This is the microscopic view. It is like looking at the individual cells of the organism. This is important and useful, but we also need to know how the whole organism functions, and how the whole ecological system functions. In calling for a focus on theory, and for research to look outside the classroom at the system of which the learner is part, I am arguing that we also need a much wider, macroscopic picture of what it is to be a learner of science. If we do this we will ask questions such as these - What is science like, and why? What is our education system like, and why? What is our society like? What are individuals like in our society and why are they like this?

Since we value problem solving very highly on the *microscopic*, individual level, it is good when more people feel confident in problem solving, and understand fuses, wiring, washing machines, car windows and other mechanisms. Precisely because this is so concrete it can easily remain at the nuts and bolts, technological level of science. When we really start asking questions, we come up against science such as the human genome project which is helping to shape our ideas of what human beings are or could be. We encounter conceptions of time, space, energy, matter, and causality which set the parameters of the possible for day-to-day reality. I feel individual experiences at the concrete level of science are relatively insignificant in the face of the cultural understandings and processes which form the parameters of science.

The fundamental question that is not asked in the focus on individual experiences is how do these individuals come to perceive and experience the world in the way they do? The learner of science is not a purely natural feeling being. No matter how young, she or he already has a history as an organic part of a particular culture and a particular science. We need to be thinking about individuals, including ourselves, in that light.

## Theory-research-praxis

The experiences and insights Valda Kirkwood recounts in her case study are interesting, and have obviously been profound. I value and share a great interest in the kinds of understandings that come from classroom-based research and reflection by teachers. However, I have noticed that the great fascination of classroom-based research and practice tends to eclipse what may be seen as the drier charms of theory. There is not so much an integration of the three - theory, research, and practice - as the use of one or two theoretical models to assist in the research and practice, with little further theoretical critique and development.

My experience in working with teachers, in the school system, and in the university system, is that the theoretical questions about what we do and what we know are rarely pushed very far towards the limits of the *givens*. So many day-to-day realities intervene in the shape of funding and staffing, class sizes, timetables, curricula, examinations, the external demands of each disciplinary field, students' situations and the watchful eye of *the public*, that we put a great deal of effort into becoming very ingenious in devising complex interactions of research and praxis to solve our problems. However, we need to stand back and look at it from a theoretical perspective, and ask ourselves if we really need to be limited to this reality, or if, with the aid of a breakthrough in thought, in theory, we could change it in some ways.

Connected knowing, an integration of theory, research and praxis, interactive learning, the generative learning model are excellent fronts to work for improving the way we do things within our day-to-day reality. It seems to me that the major steps forward from these perspectives have already been made. It still remains to work more with teachers, to reach more teachers with greater understanding, and to become more expert in using the possibilities of these perspectives. These approaches consistently come up against puzzling dilemmas. For example - On what grounds do

we discourage learners from asking non-scientific questions about science (How does the rock *feel* when they drill it?) What status can the understandings of a student or a teacher have in the world of scientific knowledge? How do we think about the institutional requirements of science learning when the theories driving the approach to learning and teaching put their main emphasis on practices relating to individuals?

These dilemmas lead to the need to push our theories of ourselves and our reality a great deal further than we generally bother. There are many important issues that the generative learning model, interactive teaching, connected knowing, and the theories behind them do not address. Constructivism has reached a point where the models which got it started so well need critique and further development. That is why it seems to me that constructivist science educators wanting to take a big new step forward which will have an impact on gender issues should put their next efforts into theoretical development.

### Synthesis and connectedness

Valda Kirkwood argues for the strengths of a case-study approach, a focus on the individual and the personal in a learner, as a way of making progress on gender issues and achieving a synthesis of knowing which, I guess, she sees as a way of enabling individuals to experience science as universal but not masculinist.

Valda Kirkwood's response to my paper presents an interesting account of *connected knowing* in her own work as a feminist science educator and researcher. She sees *connected knowing* as a means of integrating theory, research and practice in the development of a *living educational theory* in order to improve practice as a teacher.

Synthesis and connectedness are important issues. Feminists identify compartmentalising and splitting as one of the major processes in a masculinist culture. Facts are separate from values and feelings, public is separate from private, minds are separate from bodies, and so on. These separations go together to make a particular pattern. If we simply connect along the lines of personal experiences and inclinations, we will get a particular network of connections which will differ in every individual. If we want to make connections to deal with questions about issues that connect individuals on the basis of a generalisation - such as gender - we need to include individual experiences, but take them past the level of the individual to the level of generality and commonality- which is the level of theory.

Valda Kirkwood suggests how individuals can move into new areas for them personally on the basis of their own connected knowing, but not how we might achieve new breakthroughs in a discipline without the benefit of some theoretical generalising.

### Shifting the paradigm

Now I wish to shift the paradigm and discuss some of these matters briefly in different terms. Valda Kirkwood's sub-title "Reflections on Praxis" contrasts with my subtitle "Problems of Theory", and one of her main points is that theory must not be divorced from practice and research. In a different paradigm, this concern makes no sense at all because all praxis is theory driven, and all theories which are paid any attention whatsoever will have consequences in praxis. As Karl Popper pointed out "Observation is always selective .... it presupposes interests, points of view, and problems." (Popper, 1963: 46) My call for a project of theoretical development does not come from a position where theory *can* be "divorce[d] ... from the reality of the day-to-day educational practice" as stated by Valda Kirkwood. The question is how much of that day-to-day reality we are to think of as natural, given, and immutable.

It now seems there is no such thing as *natural* in the way we used to think of it. Observation is full of theory, and what we see is what beings with our consciousness are able to see. On one level we know this. We do not see ultra violet light, but some insects do and the world looks a different place to them. If we carry that idea to every aspect of our interaction with the world- including our thinking- we must acknowledge that science, the world, and the human individuals in it could be understood in very different ways from how we customarily think of them. This means that science is no longer privileged as *reality* but is just a cultural truth of a particular sort. Even more radically the individual has no *reality*. We ourselves are all products and truths of our culture.

I would like to look at this relationship between knowing about the world and the individual knower in a different light. We often think about our knowing as of at least two kinds - there is the experiential, personal kind of knowing, and there is knowledge of facts. These two kinds coincide roughly with the division between the arts and the sciences.

It is like the division - indeed in some ways it is the same division - between the archetypal parents. The patriarchal Father is loving, but stern, hard, demanding, achieving, and firm in judgement. The Mother is infinitely loving in a soft, forgiving, caring, non-judgemental way. At times a choice is forced between these two parents, and it is very painful and difficult. As far as one's own self is concerned there is no outward model for how to reconcile these two parents within oneself. It becomes a private concealed thing in which one parent may be ruthlessly and painfully repressed, or the two may be reconciled in difficult private compromises which themselves must be repressed at public moments of forced choice. There are questions we are not allowed to ask in science - if we know what is good for us, if we want to succeed.

The idea of connected knowing is an attempt to bring these worlds together - the arts and the sciences, the Mother and the Father - and for that reason it is part of the feminist project of trying to change the realities with which we find ourselves. Two hundred years of feminist theorising, research and practice has shown us that even when there are no legal barriers to women's desires, goals and values, there are still barriers that say "Thou shalt not...". To make the kinds of changes that many women (and also many men) desire, we have to go to the heart of our culture where the knowledge and values of our culture are enshrined. Preeminent among the realities, we find - no longer the divine law - but the *reality* of science, the way the world *is*.

An essential step in bringing together the Mother and the Father is to question the nature and authority of the scientific Father. I do not fear that this kind of questioning will produce theory which is irrelevant to, or opposed to reality and practice. If the theory is good for our times it will have - at least on some people - the same effect as Valda Kirkwood's crucial experiences. Like her, they will find research and theory that really seem to account for things that have been worrying them, and really seem to offer clear ways forward to apply their insights and intuitions, and change reality as we know it.

## References

Popper, K. (1963) *Conjectures and Refutations*. London: Routledge and Kegan Paul.