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## A (Cybernetic) Musing: Cybernetics and Human Knowing

### Abstract

In this column, I discuss a cybernetic understanding of the relationship between teaching and learning, largely through reference to the work of the Swiss-German educationalist, Friedrich Froebel, who I claim was already a second order cybernetician 125 years before modern cybernetics was invented. Froebel's proto cybernetics is demonstrated through his interest in error, autonomy (and self-direction), responsibility and generosity.

I explore Froebel's cybernetic educational ideas within a context of educational cybernetics as generally understood, interpreting the connection between the two and the lessons to be learnt from Froebel, especially in articulating second order cybernetics.

Keywords: Autonomy; Entailment Mesh; Error/mistake—necessity of; Error/mistake—value of; Froebel—teacher; Generosity; Learner; Listening; Responsibility

## Introduction

In this column I will approach (a cybernetic interpretation of) the relationship between teaching and learning. I will do so by reference to the concepts of Friedrich Froebel, whose name will be familiar from earlier columns. I shall show that, approximately 125 years before the birth of cybernetics, Froebel was already a (second order) cybernetician in his approach to teaching and learning. Thus I shall bring out not only some concepts I believe to be central to an up-to-date cybernetic understanding of teaching and learning, but also I shall bring another person into the fold of proto-cyberneticians. I have excluded a discussion of implementation from this column. However, having made my point, I hope to return to the matter of implementation shortly.<sup>1</sup>

In part, this column is developed from what the editor and I decided to leave out of my last column, because it gave me a chance to expand further on this important topic. In part, this is also my acknowledgement of the debt I owe to my liberal education, and especially to Froebel and the teachers in the Froebel kindergarten I attended.

This column, in keeping with others, reflects arguments made in earlier issues of this Journal. I am wary of over-referencing predecessor columns: there is a balance to be found between the continuity of development and the autonomy of each piece. I therefore include a paragraph at the end pointing to some back-links, for any who may wish to pursue them. Other (key) references are handled in the conventional manner.

## Friedrich Froebel's View of Education

Friedrich Froebel was a cybernetician before the time of cybernetics. We make this claim for many people: it's a way of establishing the legitimacy of the field. But in Froebel's case, the claim holds better than in most.

Froebel was born in 1782 and died in 1852. It is strange he is so little known, where, contrastingly, Maria Montessori is so famous, for you can read many of her ideas as "softenings" of his. Nevertheless, Froebel's kindergartens (child gardens) exist worldwide. He invented the metaphor of children as plants growing in gardens and he was one of those who invented our modern concept of childhood.

Froebel's notions of education are extraordinary even by recent liberal standards. For the early 1800s they were astonishing. They belong in a tradition with Rousseau, Dewey, Pestalozzi, Kelly and Piaget, Brouwer and, more recently, von

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1 See Chapter 20.

Glaserfeld and Lochhead as well as a number of teachers: but Froebel's notions are more radical, and are profoundly constructive.

At the centre of his thinking is a notion of the child as essentially well-directed, wholesome and whole, balanced. Froebel believed each child "knew" what and when (s)he needed to learn (and is, thus, purposive). Each human is born with a wish and an ability to learn. A Froebel teacher learns not to lead, but to look for signs in the child of what the child is beginning to seek, and to aid the child exploring this. Thus, the child (the learner) is the leader. Froebel believed in the now unfashionable idea that humans are inherently good. Humans are damaged when forced to go against their nature, which is the root of bad behaviour: a natural inclination for one thing, contradicted by an externally applied pressure for another, creating inner conflict. He saw this happening most dangerously through education, where forces of compliance and homogenisation are common, together with a belief in learning by rote and according to the teacher's (and text books') pre-dispositions. However, although he saw education as the major area of such mal-forming, he did not exclude other areas of social forming.

It is not possible to test Froebel's tenet. Were it possible, the test would be deemed unacceptable. But this argument applies equally to the views held by the educational establishment: we do not demand conventional wisdom is tested. I have argued before for an approach in which generosity and goodness are seen as the norm, rather than the quirk so many nowadays would have us believe. The available options are to evaluate them through personal experience/anecdote, and argument about logical consequences and requirements. But it's also hard to untangle the bits of Froebel's thinking that have been imported into general education (selectively and partially, so they are not indicative of Froebel, but rather a mix-and-match).

Froebel's understanding of the child was remarkable and radical. He thought of even the youngest child as autonomous and responsible. Each child creates his/her own understanding of the world they find themselves in. The job of the teacher is (recognising the learner's autonomy and responsibility) to facilitate this, to support the enquiry the child naturally follows, and the curiosity within, especially by encouraging exploration (through play) and generally supportive behaviour (which may include modestly nudging a child back on course, when the child wanders too far). There was also no punishment in the normal sense: children learnt from mistakes, so mistakes are a means of learning. Errors, of learning and of behaviour, are generously looked upon.

On his deathbed, Friedrich Froebel is reported to have said

"Look after my flowers, but look after my weeds also. For I have learnt much from both."

This utterance tells me of the thinking behind his concepts of the kindergarten: growth in children, and the benefit of error. I find it profoundly moving.

## Cybernetic Themes From Froebel

I find the very contemporary cybernetic concepts Froebel uses striking and worth exploration. Of the themes I mentioned in, or have developed from, the previous section, I see the following as at the centre of cybernetics.

### *Error*

At the heart of early cybernetics is the notion of error, which, as I like to point out, cybernetics was the first subject to accept rather than try to exclude. Handling error is the function of feedback. Error is a fact of cybernetics, something to manage, to live with and, ultimately, to try to benefit from.

But how do we benefit from error? One way is in developing second order understandings that allow us not only to correct for a particular error, but to learn from it, so we may either become more accurate or discover new possibilities.

### *Autonomy*

Then there is the concept of autonomy. It didn't take long for the inventors of Autopoiesis, Humberto Maturana, Francisco Varela and Ricardo Uribe, to realise they were talking about autonomy. Autonomy is, in a sense, at the centre of second order cybernetics: the generalised salient quality of an autopoietic system.

### *Responsibility*

Responsibility is a concomitant of autonomy. In a universe of discourse populated by autonomous entities, there are differences, individuality and responsibility. Whatever course each autonomous entity takes, and its reaction to what happens to it, is its responsibility. Our willingness to forget this at a personal and social level may be a key factor in psychotherapy: the results, in terms of a blame culture, are all too easily seen today.

### *Generosity*

Finally, generosity, essential to permit the success of such a quintessentially second order cybernetic act as conversation and as a basic human behaviour (Glanville, 2001d), is at the heart of Froebel's analysis of the nature of the human child.

This is the basis of my claim that Froebel can be considered a cybernetician before the invention of cybernetics.

## Second Order Cybernetics and Education—A Link

Many have used the word learning in connection with cybernetic systems. We are familiar with notions of cybernetics in education, but these often come from older cybernetics applied to a notion of education scarcely concerned with liberation (or, as Froebel might have said, non-enslavement) of the individual, but rather with control and restraint: the notions of efficiency and training so typical of current governmental thinking and of the sort of technology that we have, generally, brought to education (*e.g.* programmed learning—no matter how multiple choice and full of illustrations—and multiple answer questions—the world as restaurant). I want to set a background against which we consider education as a second rather than first order cybernetic activity. The benefit of (responsible) individual development, of heightening and amplifying abilities and possibilities, is far greater than that gained when we turn students into the right shaped peg for whatever hole society thinks (s)he should fit in.

I see liberal education as essentially human. My interest is to develop and support the human, the humane, the humanitarian. This I see as a major undertaking of second order cybernetics.

### Expanding on Froebel: The Learner, Error and Ignorance

The crucial element in Froebel's scheme is the learner. We have come to place the teacher on a pedestal above the student/learner (literally: see Mike Robinson's 1979 classic paper). But insofar as there is any expert, anyone in a superior position, it is the learner, with private access to what (s)he knows, how (s)he knows it, and what (s)he wants to learn. The learner has a couple of elements that can be used to assist attempts to learn.

Error can help. It is important as a source of variety and novelty. Error tells us that our descriptions of the world we find ourselves in aren't in concurrence with that world, at the "moment". This allows/requires us to change these descriptions, either by reworking them or by finding something new. Both are strategies to accommodate the variety of the excluded. Error provides a mechanism for learning, part of which is the inclusion of more variety.

Ignorance is a prerequisite for learning. I imagine most readers, on occasion, will have had the experience of finding what they already know, hindering attempts to learn: an experiential indicator of how a lack of ignorance prevents us from learning. "A little learning is a dangerous thing."

The ignorance I refer to is not absolute ignorance, but "local" ignorance of that which is to be learnt. The need for ignorance is tautological (to learn something, I have not to know it already; not knowing it, I am ignorant). What is impor-

tant is that we recognise this “local” ignorance and don’t try to hide in pseudo-knowing; and that we no longer use the epithet “ignorant” abusively. Learners learn through their ignorance and may benefit from their errors.

## Individuals, Learning and Knowables

Each learner is distinct: different, individual, differentiated, autonomous—for logical reasons (such as those often expounded in this Journal, particularly related to George Spencer Brown’s work); and because they have different experiences/understandings (and different view points). Each learner confronting a similar situation comes with these differences—and their understandings are private. They may appear homogenised in representation (language as a social construct), but what you and I understand in an apparently common act of representation must be individual, distinct, different and private. This does not exclude the possibility of a social agreement and a workable semblance of a common world—and hence of such apparent phenomena as the artefacts of science (Glanville, 1996a). But it encourages us to remember all generalisations come from individual experiences. (The precedential presence of the observer is essentially constructivist: my position is clearly not realist!)

Consider how we may, against this background, think of “knowledge”. No matter what knowledge may be, it is known by knowers. Thus it is “knowable”. But each knower is different, knows differently and privately; each approaches the potentially knowable from his/her own history and background, with his/her own intention and concepts. For each there is a different approach. How come, then, we insist on a fixed route through knowables?

There appear to be reasons other than convenience (of the teacher, of a society that seems to find conformity desirable).

One concerns performance. Story telling can be magical and captivating, carrying us with it (the magic of the theatre). A story well told by a teacher (actor) convinces. I am not sure whether anyone knows how this works. The account I give myself, is that we lose (for a moment) our selves, and hence our distinction (as with music and love).

The other is historical. The notion that knowables can be organised to appear as consequences of certain primitives may not originate with Euclid, but it certainly gains credence through him. The axiomatic system into which he organised geometry is perhaps the first great arrangement of knowables into a fixed hierarchical path order. But before Euclid geometry was not like that. Euclid’s undertaking was to systematise the chaotic ragbag that was the collection of proofs that constituted the body of geometry. I fear we think of geometry as axiomatic in its nature, too often forgetting that Euclid’s great achievement

was to forge it into this form. His success, a post-rationalisation that gave order where there had been little or none, has, consequentially, both helped geometry grow and influenced how it does so. Euclid's system is a triumph of human imagination. It is not how things were or are. Euclid's fundamentals do not have priority, except as a means to his explanation. In much of our thinking, we have taken Euclid's geometry as an unquestionable, general model. In doing so we may have forgotten how and why it came about.

In contrast, for each individual approaching some unfamiliar area there may be concepts they already have that are to be found in this new area. These concepts will be different for each of us. To present the area (subject) as though there were only one way of approaching it, or even as though there were an optimal one, is to ignore the distinction that allows us to be, which we can only get away with when a reduction of our variety—and hence a destruction of distinction—is permitted. If we wish to make a subject constituted of knowables more accessible to potential learners, we should allow many different approaches, with first access through any of the knowables that seem familiar, interesting or challenging to us, as the learner. In effect, this means that learnable topics making up some subject must be organised in a circular mesh. Such a structure was proposed by Pask and Scott (1973) as the form of their “Entailment Meshes” of learnables, and is the form since taken by the Internet. I argued that such structures require of us generosity—as does the use of teachback and other conversational communication means (see below).

None of this denies the importance of presentation: for instance, the power of the drama in the story that I mentioned. Yet we might pause to consider how we change a story, not only the tone and details, but also the sequence, to match the audience.

## The Teacher

I have pointed to the role of the teacher in Froebel's scheme. The teacher does not instruct. The teacher does not know subjects: (s)he is not an expert. Or, at least, this is not his/her job. The teacher's role is, rather, to have a more generalised “knowledge” upon which to act (“knowledge” for action, knowing about knowing). The teacher may, of course, be an expert in some subject a learner wishes to learn, but it is not necessary. In contradistinction to the Irish wag's witty comment (He who can, does. He who cannot, teaches), the teacher teaches: teaching is what he does. And teaching is a second order activity, not a matter of having and pumping out “knowledge”, but of supporting the other as (s)he finds his/her own way of understanding, of giving form in their learning, of making their experience information.

So what, in the light of Froebel's essentially cybernetic views (and those argued above), can the teacher do?

(S)he can guide, pick up clues, modify, bring gifts: as it were, point out features on the student's wandering (that is both the material and the trace of learning), occasionally inserting and modifying sign posts! (S)he can also help in teachback, that is, in confirming the learner has learnt, by having the learner explain his/her understanding, perhaps opening a further conversation to discuss the outcomes. (This is a feedback loop, enriched and complicated by the assumption that each link in the loop can add in its own material.) In many respects, the teacher is just a student paid more, occasionally with an agreed right to tell the learner (s)he is right—or wrong! Cybernetically, (s)he provides part of the critical ability that helps the learner steer his/her course, and, in the conversation, is also a further resource the learner can borrow or appropriate. (S)he is both interactor and mirror.

And (s)he can inspire, enthuse, tell stories, engage, encourage, focus, create coalitions, care, dramatise, explain, discuss, even test and bring love; all the while keeping distinct in his/her mind not only each learner but also the difference between what we think and feel and what we do with it.

## Postscript

Finally, what does a teacher need to be able to take part in teachback? To be able to listen. In our world, this is a forgotten skill. We make the mistake of believing that we must each be given our voice (in some languages the words for voice and vote are homophones). But what use is a voice without a listener? The great German artist Joseph Beuys understood this:

'Beuys' primary requirement for true communication was the existence of a reciprocal relationship between individuals. 'For communication it's necessary that there be someone who listens. There's no sense in a transmitter if there's no one who receives.'

Panel entitled "Communication" at the Joseph Beuys Exhibition, Royal Kilmainham Hospital, Dublin, read on June 2<sup>nd</sup> 1999.

There is no conversation without listening. There is no interaction, no participation, no communication, no connection—without listening. Yet we remain deaf. We learn how to speak, but we unlearn how to listen.

Just as there is no learning without ignorance and error, there is no listening without waiting; for the other to act. And the teacher cannot learn for his/her students, nor can (s)he take responsibility for them or even inject responsibility into them.

We have forgotten how we work in the mad world of the coded message where politicians claim they “have made it perfectly clear” (so we should understand) and where our understanding of communication is all too often based on Shannon and Weaver’s account of coded messages flowing down wires: where, where we mistakenly believe the meaning is in a code of words and not in our minds. Froebel understood that at the heart of the human experience is the act of listening. And of waiting. His teachers learn and practise this.

*In addition, the columns that I have written and which have appeared in this Journal contain a growing base of concepts. Earlier columns have dealt with several of the topics raised here, arguing points that are, in this column, assumed. In particular the columns in Vol. 3, Nos. 2 to 4, and Vol. 4, Nos. 1 to 3. These columns dealt specially with matters of communication, conversation, learning and error, and coding and the military. They may be of interest to the reader, as may my last column in Vol. 8, Nos. 1–2.<sup>2</sup>*

*These (and all other) columns may be found on the Journal’s web site: [www.imprint.co.uk](http://www.imprint.co.uk) unde ther “CHK” tab, and then the issue number.*

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2 These papers are to be found as Chapters 3, 4, 5, 6, 7 and 17 in this Volume.

Combined references from other articles as well.

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- Reference to Froebel's life and work can be found on the Encyclopaedia Britannica web site. The index page is at: [http://members.eb.com/bol/topic?tmapped\\_id=77643000&tmap\\_typ=dx](http://members.eb.com/bol/topic?tmapped_id=77643000&tmap_typ=dx)
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