

2004

Can the love of learning be taught?

R. Nilsen

University of Wollongong

Follow this and additional works at: <http://ro.uow.edu.au/jutlp>

Recommended Citation

Nilsen, R., Can the love of learning be taught?, *Journal of University Teaching & Learning Practice*, 1(1), 2004.

Available at: <http://ro.uow.edu.au/jutlp/vol1/iss1/2>

Can the love of learning be taught?

Abstract

This paper is an expanded version of a talk given at a Generic Skills Workshop at the University of Wollongong, and was intended for academic staff from any discipline and general staff with an interest in teaching. The issues considered in the paper include the capacity of all to learn, the distinction between learning as understanding and learning as information, the interaction between the communication and content of ideas, the tension between perception and content in communication between persons, and the human functions of a love of learning. In teaching, the creation of a fear-free environment is emphasised, as is the use of analogy as a means of breaking out of one discipline and making connections with another, with mathematics and history being used as a possible example. Some of the issues raised are explored in more depth in the notes at the end of the paper, to which there are references in the main text. About the author. Rodney Nilsen studied literature, mathematics and science at the University of Tasmania. He proceeded to postgraduate study at The Flinders University of South Australia, studying mathematics under Igor Kluváněk and, through him, coming into contact with the European intellectual tradition. He held academic positions at the Royal University of Malta and the University College of Swansea, Wales. Upon returning to Australia, he took up a lecturing position at the University of Wollongong, where he continues to teach and conduct research in pure mathematics. At the University he is a member of Academic Senate and is the Chair of the Human Research Ethics Committee. He received a Doctor of Science degree from the University of Tasmania in 2000. His interests include literature, classical music and the enjoyment of nature.



PERSPECTIVES

Can the Love of Learning be Taught?

Rodney Nilsen

Faculty of Informatics
University of Wollongong

nilsen@uow.edu.au

Abstract

This paper is an expanded version of a talk given at a Generic Skills Workshop at the University of Wollongong, and was intended for academic staff from any discipline and general staff with an interest in teaching. The issues considered in the paper include the capacity of all to learn, the distinction between learning as understanding and learning as information, the interaction between the communication and content of ideas, the tension between perception and content in communication between persons, and the human functions of a love of learning. In teaching, the creation of a fear-free environment is emphasised, as is the use of analogy as a means of breaking out of one discipline and making connections with another, with mathematics and history being used as a possible example. Some of the issues raised are explored in more depth in the notes at the end of the paper, to which there are references in the main text.

About the author. Rodney Nilsen studied literature, mathematics and science at the University of Tasmania. He proceeded to postgraduate study at The Flinders University of South Australia, studying mathematics under Igor Kluvánek and, through him, coming into contact with the European intellectual tradition. He held academic positions at the Royal University of Malta and the University College of Swansea, Wales. Upon returning to Australia, he took up a lecturing position at the University of Wollongong, where he continues to teach and conduct research in pure mathematics. At the University he is a member of Academic Senate and is the Chair of the Human Research Ethics Committee. He received a Doctor of Science degree from the University of Tasmania in 2000. His interests include literature, classical music and the enjoyment of nature.

"...What is the use of transmitting knowledge if the individual's total development lags behind?"

Maria Montessori

Plato's dialogue, *The Meno*, is set in Athens in about 400BC. The dialogue begins with an attempt by Meno, a young aristocrat, to say what virtue is. Socrates demolishes several attempts by Meno to define virtue, and this part of the dialogue ends with Meno comparing Socrates to a stingray, because he has "stung" Meno into a state of mental numbness and perplexity. Socrates then mentions a paradoxical argument about knowledge: if we have knowledge there is no need to seek it, but if we don't have knowledge we don't see a need to enquire after it. Socrates disagrees with this argument and then proceeds to a demonstration which he claims shows that knowledge is a form of recollection.

In the demonstration Socrates poses a mathematical problem to an uneducated boy, one of Meno's retainers. The problem is the following: given a square whose side has length 2 metres (say), determine the length of the side of the square which is double the area of the given square. Socrates proceeds by asking a series of questions. At first, the boy says the answer is the square whose side is 4 metres, then he says 3 metres, but he is led to conclude that neither of these can be correct. The boy sees that although the answer at the beginning seemed self evident, in fact he doesn't know but is perplexed and unaware of how to proceed. Like Meno, the boy has been "stung". Socrates says "...starting from this state of perplexity, he will discover the truth,...", though I simply ask him questions without teaching him." Further questions are put to the boy, until he comes to understand for himself that the answer to the problem is a square which has as one side a diagonal of the original square.¹ Socrates says that the answers to the questions came from within the boy, not from Socrates, and that his demonstration has shown that the boy "remembered" the answer to the problem. Socrates goes further to say that the truth about reality is within us, and that one should take courage and try to discover--that is, to recollect--what one doesn't happen to know.²

Socrates' theory of knowledge as recollection is not so much of concern here, but there are many points from this episode in *The Meno* which remain useful and important.

One of these is that *the teacher should not make assumptions* about what students can learn. It can be surprising what people can learn and the teacher must remain open to all possibilities. The capacity of students to learn does not simply depend upon themselves, but upon the environment in which they learn and what is regarded as valid learning. In the *Meno*, Socrates emphasises this by deliberately arranging that the person to whom he directs his questions is previously unlearned in the subject, which happens to be mathematics. One of the main points in this part of the dialogue is that the boy learns without any *apparent* prior knowledge. Socrates' viewpoint is that this lack of knowledge is indeed only apparent; in fact, he considers that the boy already knows the answers, it is a matter of creating an environment in which he can "recollect" them. He is really saying that the capacity to learn, even the most unlikely things, is inherent in all of us. There may be capacities within ourselves that are not recognized until the appropriate circumstances arise.

Socrates puts it to Meno that he has not told the boy what he should answer. Socrates says the questions simply call upon the boy to give his own opinion at each stage. The boy *looks within himself* and his own experience. The answers may be wrong, but the wrong answers are gradually eliminated. Socrates enjoins the boy to "always say what you think". That is, look within yourself to find what your real opinion is, and say it. The success of the enquiry depends upon the boy doing exactly this, without fear.

At the end of the questioning, the boy has not learned something which he has been told simply to accept. He is in a state where he could defend his conclusions were he challenged to do so. The learning has come more from the process than from the conclusion. The answer to the problem posed by Socrates has a strong elegance and aesthetic appeal, but the actual answer to the problem is not the point of the demonstration. The learning has come more from the process and less from the information conveyed in the conclusion or in the attainment of the immediate objective.

Socrates takes the episode to be evidence that learning is a form of recollection. He regards the immediate learning task as much more than a purely technical exercise, and relates that task to wider issues. Also, Plato seems to be saying through Socrates that his demonstration of mathematical knowledge as a form of recollection is the model for ethical and moral knowledge as well.³ In this episode Socrates sees knowledge as all of a piece, not simply as a fragmented collection of different pieces of information

The ideas above are relevant to considering how to develop a love of learning and a willingness to master new skills. Now, the love of something or someone must come from within the person; it cannot be imposed from outside. So in trying to encourage a love of learning, the teacher must try and create circumstances whereby this occurs spontaneously. Success depends not simply upon the competence or skill of the teacher, but also upon the free and open response of the student. In *The Meno*, for example, the boy may develop a love of learning because within himself he has felt a power and capacity to understand, discover, and grasp truth in ways of which he was previously unaware. When a person suddenly feels aware of capacities which he or she had not imagined they possessed, it can have a tremendously liberating and "empowering" feeling. Richard Lewontin expresses this when he writes: "It is not the truth which makes you free. It is your possession of the power to discover the truth."⁴ Moments of awareness of inner capacities for understanding and discovery, qualities which all possess to varying extents, are what the teacher should aim to encourage, create and inspire; but ultimately the creation of such moments does not come from the teacher, it must come from within the other person. If students come to feel a capacity within themselves which they had not felt or were fully aware of before, then they are on the way to a love of learning. This in turn leads to a willingness to continue to learn, to reflect, and to develop throughout one's life.

The development of modern technology has contributed to the creation of a situation in our culture where the teacher is under great pressure to identify learning with the access and imparting of information. It is not possible, therefore, to emphasise too much that a mature form of learning is more than the accessing of information or the imparting of it. If the teacher is to do no more than convey information, the only response encouraged from the student is on the level of "have you memorised that?" or "make sure you know that!" This is not to say that accessing and gaining information are not important; indeed, they are absolutely essential, but primarily these are a means, not an end. The mere conveying of information is a form of imposing learning from the outside and, as such, it can have an authoritarian aspect to it which should be avoided. A state of knowledge or an awareness of truth should come from an inner assent, not from submission to the authority of the teacher, nor from something which is purely external to the student and strikes no inner chord of resonance. At the same time knowledge is not a merely personal matter, and it cannot and should not be rejected simply for reasons of personal taste or convenience.

If a person has knowledge, and if that knowledge means something to the person, it is natural and, in the course of employment often necessary, to talk or write about what is known, and perhaps even about what is not known. It may appear almost obvious to say it, but the importance of communicating should come from a need to convey the content of the communication.

Now, it is common to hear the view that the content isn't important, it's only the perception that matters, and in some cases the *realpolitik* of a situation may make this so. But it is rare indeed in such a situation for there to be an open admission that only perception matters.

For any such admission would in effect be saying "we are not interested in what you say, that is unimportant, we are only interested in whether it sounds and looks good." Such an admission would reveal the situation to be essentially a public relations or "feel-good" exercise with little or no substance to it, and the admission remains unspoken so as to maintain an illusion. Once the idea that only perceptions are important is accepted, it follows that qualities and skills such as intellectual autonomy and critical thought are unimportant, and perhaps even undesirable⁵ (except to the extent that they contribute to creating a desirable perception). But such a view tends to a marked intellectual and social cynicism, leading to a routine acquiescence in a form of deception. So, the idea that it is only perceptions that matter should be rejected. Perceptions should only matter to the extent that they serve a truthful and legitimate purpose. Of course, in these times, the idea that only perceptions matter is mostly taken from the corporate world where products are promoted on the basis of how they can be perceived instead of upon their actual qualities, but such an approach in education would mean that education and product promotion are to be regarded as synonymous. So it seems that at least within an educational environment, the technicalities of the act of communication always should be subsidiary to the content and truth of what is being conveyed.

But this leads to an important point. The act of trying to communicate a given content, especially when repeated or when subject to critical reflection, may produce new insights into the content, it may reveal deficiencies in it, and it may demonstrate the need to change it. From this viewpoint, the attempt to communicate is a form of reflection upon the content of the communication, and may lead to new thoughts and insights. So there is a complex relationship between the content and the communicating of it. Nevertheless, the high desirability of a skill such as clear communication, whether verbal or written, primarily comes from the value of the content and the need to render it as truthfully and to make it as comprehensible to others as possible, rather than from the communication act itself. In our culture, there is a range of pressures which urge us to identify the content with its method and style of communication, pressures which simply come as variants of the attitude that only perceptions are important. These pressures become acute in a culture where the superficial and fleeting images conveyed by the electronic media are taken as the norm for the content of almost any communication. The teacher who succumbs to these pressures trivialises the content of the communication with students and the liberating potential of education is sharply reduced.

The objective in encouraging a love of learning and a wish to acquire new skills should not be seen as one with an immediate pay-off, but rather as an "investment" in the future. This is especially the case in view of the following paradox: it is not possible to prepare for the future by preparing for tomorrow. For, whereas the state of things tomorrow is more-or-less predictable, knowledge of the medium to long term future may be utterly inaccessible. So, the best way to prepare for change is not necessarily by aiming for immediate objectives, because the appropriateness of those objectives may soon be in doubt. There is a need to consider very carefully before aiming for objectives whose future validity may be put in doubt by changes that cannot be predicted or even anticipated. A desire to attain short-term specific goals should not be confused with preparing oneself for the long term future.

A mature love of learning comes from seeing the immediate and more tangible learning task in a wider context, a context which enlarges the person, and it is the wider context which gives a long term point to learning new skills. The sense of a wider context is also important in forming the capacity for judgment; that is, the capacity to discern the relative importance between different aspects of an issue or problem.

As well, an aspect of judgment is to realise that the resolution of a problem or issue generally requires a conceptual framework and method of attack that is commensurate with the intrinsic difficulties. In a given situation, this may lead us to question whether an approach to a problem is adequate for the task, thus creating an awareness of ignorance; that is, a lack of knowledge, as illustrated in *The Meno*. A main problem with ignorance is that it tends to be self-perpetuating; for ignorance is an absence of awareness as often as it is a lack of specific knowledge.

An awareness of one's ignorance, or of the inadequacy of one's conceptual framework, should rightly be viewed as a form of knowledge, one which makes it less likely that spurious solutions will be posed for complex problems.

It is important that the subject of learning should come to have meaning in the person's life. Such a meaning is never final, but should continue to develop and affect the way the person lives and thinks about his or her life. It should help the person develop a "distinctive philosophy" of life. Once such a "philosophy" becomes important, it guides the person and gives a direction. This is especially important and of potential value in a time of cultural flux and continuous technologically-driven change. Clearly, the teacher needs to consider the development of such a philosophy to be important for himself or herself if he or she is successfully to encourage it in others. The University experience should, ideally, be a unique period in a person's life which stands out from other periods by its distinctiveness and a sense of "difference" from wider society. This is not to say that it should be remote from society, nor that it should be unconcerned about society. Indeed, there is again a paradox: if universities are to *engage* with society rather than merely *mimic* society, they must in some sense be different from society.⁶

A common dichotomy in conceptions of learning is that between learning conceived of as understanding (and all that that implies), and learning conceived of as instrumental skill. I take generic skills to be skills which arise from the process of learning when that learning is conceived of primarily as understanding. It is the conception of learning as understanding which has given the University its distinctive position in society, a position which has been under sustained attack and continues to erode. The love of learning is a way of increasing our own self awareness by a rigorous and systematic use of our minds, increasing our awareness of other people and their different outlooks and cultures, and thus appreciating and helping to realize human potential. Its objective is primarily one of humanising the individual and enlarging horizons and, as such, it is intangible and cannot be measured.

Can a love of learning be taught? Well, this seems unlikely; at least, not in the sense that certain actions will automatically lead to certain results. It is not possible to tell what the potentialities of the student are, but it is possible to try and create an awareness in the student so that a love of learning can develop spontaneously. If it isn't spontaneous, it will not happen. It must be borne in mind that it is also a question of degree. Not all students will respond in the same way or to the same extent, but the question of the technical standard of attainment is pedagogically of far lesser importance than the extent to which the student's potential is realized. But even if the love of learning cannot be taught, it remains a challenge, and even today it remains a privilege, to try and create an environment in which it may occur.

What can be done in the classroom? Despite the value that there is in *The Meno*, there are problems in our own culture about adopting a strict form of the Socratic method in the classroom. In fact, there were problems for Socrates in his own culture, in that not everyone took it as well as Meno did when he was "stung" and made to feel ignorant. Socrates did not try to make others "feel good" about themselves and this, even from a strictly pedagogical viewpoint, can be negative. On the other hand, if the primary objective is to make students "feel good" about themselves, then it is unreasonable to expect them to learn very much.

One attribute of a mature learning is a sense of both strengths and weaknesses in one's knowledge and within oneself, and such a state is unlikely to be attained by emphasising the one too much over and against the other. Therefore, the teacher has a continuing and sometimes delicate balance to achieve, namely the balance between ignorance and knowledge.

A help in this regard is to realize the importance of a fear-free environment. This may be difficult to encourage in class, as students often prefer to give the answer they think the teacher wants, rather than to look within themselves and "say what they think". It is a challenge for the teacher to create a fear-free environment in which wrong answers can genuinely be felt to be leading towards understanding.

Students need time to reflect upon the material, and this must be positively encouraged. There is a need not to present too much work. The reflective process aims to bring out the meanings, significances and wider ramifications of the material which may not be immediately apparent, and there is a need to teach in such a way that this becomes possible. It is better to present fewer ideas, provided that the student grapples seriously with those ideas; the student must not be overwhelmed by a mass of material which will stand in the way of serious thought and reflection. By creating an awareness of general ideas and concepts, not just facts and information, the teacher may help the student create a form and structure to knowledge conceived of as understanding.⁷ To achieve this, it is essential that the teacher should not perceive knowledge to be fragmentary or disjointed, but rather should be continually looking for relationships between different parts of knowledge both within and outside his or her discipline.

In the case of mathematics, the use of analogy can be a way of trying to get students to think beyond the technical confines of their own discipline.⁸ For example, a newspaper editorial is, or at least implicitly purports to be, a reasoned argument for the adoption of certain positions, policies or attitudes to matters of current discussion. Because it is a reasoned argument, it is analogous to a mathematical argument, in that it contains assumptions, inferences and conclusions. The assumptions are usually implicit and not necessarily able to be identified, there is often room to debate the validity of the inferences, and there may be sharp disagreement over the conclusions. So, the situation is rather less clear than in mathematics. But this makes it a challenge for a mathematics student to tackle an editorial with a view to using abstract reasoning to identify the assumptions, the inferences and the conclusions. With practice, this can lead to the routine evaluation of the merits of editorials, policy documents and the like, on the basis of detached evaluation rather than emotion, convenience or prejudice. It also can lead to the general skill of distinguishing fact from opinion.⁹

Applications of mathematics typically start from phenomena or a problem situation in the physical world or the social sciences. The problem may lead to the formulation of equations, or a mathematical model, which are regarded as giving an incomplete description of the phenomena, but one in which it is nevertheless hoped that essential aspects of the phenomena or problem are captured. This process of formulating a model has therefore moved *from* the observation of outside phenomena *towards* mathematical concepts and abstract ideas. But this process can also be reversed; that is, it may be possible to proceed *from* the abstract concepts of mathematics *towards* the world of social phenomena (say). This may induce students to think of abstract concepts in new and different ways, and to develop analogies which may have the effect of enlarging student awareness about the wider potential meanings and significance of the concepts.

Here is one example of proceeding from an abstract concept to an analogy which is broadly social. A central abstract mathematical concept is that of a *function*. For each of a given collection of objects, called "points" (say), the function assigns another unique point. Starting with a given point, the function may be applied over and over again, obtaining a sequence of points. Now, imagine that the points represent the collection of all possible states of the world, considered as a society. As we apply the function over and over again, starting from a given state, we obtain a sequence of states which can be regarded as describing the development or evolution of world history. Now there have been different views of how that history will evolve. On the one hand, Marxism and Christianity have maintained that history is moving towards a definite goal, a view which might be called a "convergent" view of history and which entails acceptance that the future in some sense can be predicted, if not tomorrow at least in the long term.

On the other hand, a non-convergent view of history might hold that even if history has a goal there is no way of telling what it is, and that certainly the long term future cannot be predicted. There are variants of the non-convergent view, of which "divergence" and "chaos" are two, but these views and the convergent view can all be regarded as emanating from elementary properties of the underlying function. So, there are analogies between the mathematical system determined by the function and the long term evolution of the historical system which it is regarded as describing. It is possible to develop these analogies in some detail but, even so, they should not be regarded as reducing history to simple mathematics, but rather as a way of seeing analogies between the thought of different disciplines, and perhaps as a way of suggesting that at least some of the differences between disciplines are those of degree rather than of kind.¹⁰

Another technique which has potential for widening horizons is the use of quotations. Suitable quotations will repay re-reading and pondering, like a good poem. Here are two that may be appropriate in the present context, and perhaps are useful for summing up.

"The identification of knowledge with its empirical and experiential concomitants, that is, with mere observation, acquiring and retaining information, recollection and such like, is a sign of positivism. A positivistic idea of human knowledge leads those who embrace it to disregard the connections between phenomena, concepts, ideas. And yet, a person understands some information available to him or her only if he or she grasps the connections, the relationships, between phenomena, concepts and ideas to which the information refers. It can be said that the understanding of information consists precisely in the grasping of such relations."

Igor Kluvánek^{11, 12}

" The Master said, 'To be fond of something is better than merely to know it, and to find joy in it is better than to be fond of it.' "

from The Analects of Confucius

Capturing that joy in learning in our own lives, as envisaged by Confucius, may enable the teacher to approach and sometimes resolve many of the problems raised here without nearly as much effort as might be imagined. A joy in learning produces a joy in teaching, and perhaps even inspiration in it, as well as leading both teacher and student towards a lasting sense of meaning and purpose.

Acknowledgements

I would like to thank Lynne Wright and the Generic Skills Working Party for the original invitation to speak at the Workshop. Without their invitation, I would certainly not have written this paper. I also wish to acknowledge the encouragement and comments which I received from Sylvia Nilsen, Keith Tognetti and Graham Williams upon a draft from of the paper. However, responsibility for any deficiencies remains my own.

Notes

1. Socrates draws a diagonal through the original square. This divides the square into two right-angled triangles, each having an area of half the original square. Therefore, *four* of these triangles together give *twice* the area of the original square. However, four such triangles may be easily arranged to give a square whose side is the diagonal of the original square (a diagram helps here). So, the area of the square on the diagonal of the original square is twice the area of the original square, and the problem is solved. This solution to the problem is accessible to virtually anyone, from children up, which is partly the point of Socrates' demonstration.
2. Only the bare bones of this episode in the dialogue have been given. For a full appreciation of the subtlety and richness of the dialogue, *The Meno* itself is recommended. The edition I have used is in Penguin Classics, *Protagoras and Meno*, translated by W.K.C. Guthrie.
3. This outlook has been shared by thinkers before and after Socrates. For example, in her book *Pythagoras' Trousers* (Random House, 1995), Margaret Wertheim comments: "...Nicholas of Cusa was a kind of latter-day Pythagoras, a man for whom the spiritual and the mathematical were totally inseparable." Our culture has largely lost any similar sense of the unity of the intellect and the spirit, and not only in mathematics. However, this can be seen as a lack, not as a desirable state. For a secular approach related to this question, with an emphasis on history, see Karl Popper's essay "Emancipation Through Knowledge," in *The Humanist Outlook*, A. J. Ayer (Ed.), Pemberton, 1968.
4. The quotation is from Richard Lewontin's review of Carl Sagan's book *The Demon-Haunted World: Science as a Candle in the Dark*, which appeared in *The New York Review of Books*. The review was also published in *The Australian* of 12th March, 1997.
5. In a corporate culture, there is indeed doubt as to the extent to which these qualities are considered desirable. The issue is not pursued here, but see John Ralston Saul's Massey Lectures, *The Unconscious Civilisation*, Penguin, 1997.
6. One way of thinking about this difference is to imagine the relationship of the University to society as being analogous to the relationship of the teacher to the student. That is, the University is to help realize the potential of society, with the emphasis being on culture and the use of the intellect. For other ideas on this point see pages 251-256 of Allan Bloom's controversial book *The Closing of the American Mind*, Simon and Schuster, 1987.
7. Of course, the idea that knowledge has a structure, or even that it should have one, has been under attack. Because it cannot be justified in its own terms, rational enquiry can undermine itself, when directed against itself. In many respects, this is what modern intellectual movements have done within our own culture. Thus, many currents of thought in deconstructionism and the sociology of knowledge trade upon our inability to give a conclusive justification of our methods of enquiry. Here, highly complex issues arise. However, if by drawing out all possible meanings from a text it can be established that there is no central or abiding meaning, but only a multiplicity of different and largely contradictory meanings, then the conclusion which must apparently be drawn is that only meaninglessness has meaning. But notice that although the notion of a central meaning may be abolished by this technique, it is implicitly taken to be illegitimate to apply this technique to the technique itself (since minus times minus gives a plus?!).

The mathematician Kurt Gödel showed as long ago as 1931 that mathematics cannot establish its own consistency. However, as Gödel also showed, there may be true theorems which can never be proved. Thus, Gödel's work has both a negative and a positive aspect. The lesson from this is that rational enquiry cannot be justified in its own terms, but rather requires an acceptance based upon this awareness. Incidentally, the conclusion that "only meaninglessness has meaning", and the destruction of judgment to which it must lead, sit comfortably with the idea of education and culture as a market where the quality and value of the goods in the boutiques exist simply in proportion to "consumer" demand. Thus, there is an ironic but inevitable conjunction between "radical" deconstruction and "conservative" economic rationalism.

8. The book by K. Holyoak and P. Thagard, *Mental Leaps: analogy in creative thought* (MIT, 1996) has useful ideas on this across a number of disciplines.
9. In the original talk, this was illustrated with reference to the editorial "Black Eye for Pacific Diplomacy" in *The Australian* of 22nd July, 1997.
10. Friedrich Nietzsche enunciated the doctrine of the eternal recurrence of historical events. Francis Fukuyama's essay *The End of History?*, in *The National Interest*, Summer 1989, pages 3-18, is a recent example of a controversial and "convergent" view of the development of history. In his introduction as Editor of *Virtual History* (Picador, 1997), the historian Niall Ferguson writes (p.79) "The philosophical significance of chaos theory [a part of the mathematical theory of the repeated application of a function, as mentioned here] is that it reconciles the notions of causation and contingency. It rescues us from the nonsensical world of the idealists ...where there is no such thing as a cause or an effect and the equally nonsensical world of the determinists, in which there is only a chain of preordained causation based on laws". So, Ferguson holds that the analogy between mathematical systems and history has had a serious impact upon how the nature of historical development should be perceived. Mathematics has shown that repeated observations and measurements of a system, no matter how detailed or extended, may not suffice to distinguish between a system which is deterministic and one which is purely contingent.
11. Igor Kluvánek (d.1993) a Slovakian mathematician for a long time resident in Australia, was noted for both his original mathematics and his wide intellectual range. I don't know if Kluvánek had Australia specifically in mind, but what he describes as positivism is a defining feature of our national modes of thought. This view is supported, for example, by Judith Brett's review in *Island* magazine 38(1989), page 71, where she says that one chapter of the book under review "...highlights the dominance of positivist forms of knowledge in the social sciences in Australia over more critical and humanist traditions in sociology and psychology. The sociology that flourished here was the sociology useful to governments...." See also pages 205-206 of Chris Wallace-Crabbe's essay "Strutters" in *Australian Civilisation* (Richard Nile Ed., Oxford, 1994). The notion of education as a commodity is a case of the positivist mind-set, and another is the idea that the only goals and values worth taking seriously are those which can be measured. By tending to concentrate on what is immediate and frequently narrow, by discouraging reflection, and by not taking seriously more complex views of phenomena, policy options and the like, positivism unwittingly discourages imagination and the desire to find adequate solutions to complex problems and, indeed, flies in the face of a wider reality. In mathematics and science, positivism manifests itself as a concern only with repetitive techniques and getting the right answer; in law, with a concentration upon the technicalities of legal cases and a lack of concern for questions of justice and truth; in economics as the idea that any question of value can be reduced to a question of market value, and so on. A contrast to this way of thinking is provided by Martin Buber's essay "Productivity and Existence" in *Pointing the Way, Collected Essays of Martin Buber*, translated by Maurice Friedman, Routledge, 1957.
12. In this quotation, Kluvánek's use of the word "recollection" should be taken more in the sense of "memorising facts or data"; that is, he was thinking of mechanical acts of the mind. When the same word is used in the translation of *The Meno*, referring to Socrates' theory of knowledge as a form of recollection, it does not have this connotation. But the reader will have to make up his or her own mind on the meanings of these usages of the word.