

What I Teach When I Teach Nothing

Introduction

“[...] the more the soul is filled, the larger it becomes.”

(Montaigne 1949: p. 118)

Michel de Montaigne, a French Renaissance philosopher and essayist, wrote about his own personal view of the world. His thinking was shaped by his childhood experiences of education, his work in the government and his personal observations of relationships and societal cohesion at a time of turmoil and political change in France. His writing is largely anecdotal and yet often profound, and his insights are many and varied. Three of his essays specifically consider the role of education and learning – ‘On Pedantry’, ‘On the Education of Children’ and ‘On Experience’ (Montaigne, 1949) (the titles vary with the translation, and these are taken from the translation by Donald Frame).

The anecdotal nature of his work, suggests that to understand his writing on education, we should also understand his own experience of schooling. Of noble birth, his father designed his learning regime. He was sent to live with a peasant family for the first three years of his life, so that he might develop a connection with ‘the people’. He was then brought back to the family home, where his father had hired Latin speakers to converse with him only in Latin. He himself then had to teach his parents enough Latin so that they could speak with him. He was introduced to Greek philosophy through games, discussions and solitary meditation, but with very little book reading (the usual pedagogical method of the time), and woken each morning by musicians playing a variety of different instruments. Finally he was sent to a boarding school to master a traditional curriculum, which he completed by the age of thirteen. He proceeded to undertake further study of law, before entering the magistrate system and beginning his political career.

His own diverse, somewhat chaotic yet full educational experiences lead Montaigne (1949) to advocate a move away from the tradition of book reading, with the ideal educational environment exposing the learner to as many different subjects and perspectives as possible. He was advocating an intensity and breadth to education, but I do not think he intended to promote a necessarily high 'volume' of learning in terms of detail and information. This balance of intensity of experience, breadth and individualized learning with a more easily quantified and standardized curriculum of disciplinary material is something that I would like to explore in this essay.

In my own teaching, I have designed a series of courses that privilege process over content, and provide the students with the space, time and tools to build their own knowledge on a variety of topics. The students construct their own understanding of the world around them using a variety of tools including individual reflection, independent research, peer discussion and collaborative group work. Although I am very present in the classroom and work hard to facilitate the students' learning experiences, I cannot claim to 'teach' them anything in the traditional sense. Although I can support my pedagogical rationale with a range of educational and pedagogical theories, I initially began designing these courses on instinct, with little grasp at the time of these theories. So what was my original inspiration? Why did I choose to teach by teaching nothing?

The initial brief that I was given for designing these courses was that I should teach sustainable human development in a way that complemented both the content and teaching of students' core degree studies, without any replication. A pilot had been commenced before I was appointed where students were being given expert lectures on climate change. When I began the assessment activities with the students, it quickly became apparent that the students had 'learned' the content of the lectures in a rather limited way. They could recite some of what they had heard verbatim, and when asked to create a short report, they reproduced the lecture slides as diagrams. However, deeper probing revealed that the students had not thought about what they had heard, they had not

considered how it fit with what they already knew about the topic and they had not integrated this to develop a new level of understanding of the world.

This was my target – I wanted to see if I could stop learning being an additive or cumulative process where the contents of each new lecture were being glued onto the last, and instead see if I could work with the students to construct new understanding, develop a knowledge base that required a re-examination of existing knowledge and an assimilation process to incorporate new evidence or ideas. I wanted to move from making students aware of new information to helping them construct genuine knowledge for themselves.

So my initial motivation here was not related to learning or curricular theory, but rather to a consideration of the notion of 'knowledge'. My teaching is designed to facilitate the generation of knowledge. I should clarify here my view on the difference between knowledge generation and learning. I think that learning leads to knowledge generation, and that knowledge generation itself leads to further learning, but that these processes are not the same. We create knowledge out of a whole range of inputs, many of which will be the products of prior learning. Illeris (2009) describes learning as

“any process that in living organisms leads to permanent capacity change and which is not due to biological maturation or ageing” (p. 7)

He then elaborates his cognitive perspective of learning (2009), stating that there are four types of learning that might occur:

- 1) “Cumulative” (p. 13) – the addition of discrete new units of learning to an existing mental schema (like adding a new book to a bookshelf)
- 2) “Assimilative” (p.13) – the incorporation of new discrete elements as an extension of an existing mental schema (like adding an additional shelf and book to a bookcase)
- 3) “Accomodative” (p. 13) – the incorporation of a new and markedly different element that requires the existing mental schema to be broken

down and reformed (like taking a bookcase apart and remaking it in order to better accommodate your range of books)

- 4) “Transformative” (p.14) – learning that requires changes in the organisation of the self which may be profound and extensive (like moving all your furniture round in the room to accommodate a rebuilt bookcase)

While the construction of knowledge might be similar in a cognitive sense to learning, it is different. It could be viewed as a meta-level dialogic process that integrates the products of learning with other cognitive and emotional artefacts such as opinions and intuitions. As we explore the notion of knowledge we might find that the process of generating knowledge is somewhat analogous to the cognitive processes described above, but I maintain that there is this fundamental qualitative difference that hopefully will become clearer as we progress.

This essay will further explore the notion of knowledge by considering the role of belief in the production of knowledge, the changing position of knowledge as a philosophical entity through history, the relationship between knowledge and the disciplines, the difference between information and knowledge and finally knowledge as a social and cultural product.

Defining Knowledge

“We must not attach knowledge to the mind, we must incorporate it there”

(Montaigne 1949: p. 125)

I believe that knowledge is the result of a personal relationship between ideas, sources of evidence (and resulting ‘truths’) and the individual. This is a dynamic relationship that shifts over time, is uncertain and contestable, but provides us with a working certainty that allows us to further develop the knowledge. I do not think that knowledge can exist in isolation or be defined as a discrete package of ideas, but it sits within a web-like context of further knowledge that we have developed, and a whole wealth of information of which we are aware,

but which we have not yet enveloped into a knowledge narrative. Arturo Escobar (2011) talks about science in this sense – stating that the facts of science develop into a narrative that becomes neither fact nor fiction. I like this idea and think that knowledge may be rather ephemeral, transient and contradictory – and therefore it might be both true and untrue at the same time. However, the critical aspect for me is the ‘knowing’ in knowledge – you have to ‘get to know’ the ideas, form a reciprocal relationship with them, where they change you, and you change them. As a result, it means that knowledge is highly personal to the knower – whether that be a single person or group of individuals who have come to a common understanding.

Crucial to developing a comprehension of the concept of knowledge, is a further understanding of what is meant by ‘truth’. I have already stated that truth is a rather fluid idea for me in this context, but historically, the very earliest understandings of ‘knowledge’ involve much reference to truth. Plato stated that to have the status of knowledge, a statement should meet three conditions – it should be justified, true and believed (Burnyeat, 1990). Truth is a highly complex concept with a myriad of philosophical definitions – some relating truth to accuracy of description of objects (correspondence), some to internal consistency within a system of thought (coherence), some relating truth to the cultural and historical context (constructivist), some looking for mutual agreement (consensus) and finally some that recognize truth as emerging over time, as more evidence is revealed and gathered (pragmatic) (Kirkham, 1995). This might sound rather complex and unhelpful to our need to clarify truth in relation to knowledge, but thankfully Kirkham (1995) concludes that if our belief is genuine, we can probably take that as being our own truth.

I find this a really helpful perspective to take on truth. Often when I am working with my students and they make a statement about truth, I find myself asking three questions – who *knows* that the statement is true, who *believes* that the statement is true, and who *disagrees* with that statement. I agree that if we believe something to be true, then for us and our personal knowledge of that phenomenon, it is true. This means that inevitably, different people will hold

different versions of truth, but when we are confronted by these differences, we will naturally allow these to interact with our own knowledge, which being a dynamic product will grow and develop in the presence of these differing or even conflicting truths. Bearing these ideas in mind then, it would seem that my working idea of truth is a form of bounded rationality – we can only make decisions with the information available to us, and so too, we can only understand something as true in the context of what we know (Gigerenzer and Selten, 2002).

With full awareness of the difficulty of defining knowledge and truth, and with some of the established range of uses detailed, for the remainder of this essay, I will be referring to my own definitions as described above.

The Relationship Between Knowledge and Belief

“Nothing is so firmly believed as what we least know”

(Montaigne 1943: p. 194)

I find it curious that whenever I try to define knowledge, either in conversation or in writing, I always begin ‘I believe that knowledge is...’. In other words, I do not know what knowledge is, which is verging on a comical paradox. How can I speak about the nature of knowing, when I do not ‘know’ what it is to know? Untangling this circular knot of thinking, I have found Williamson’s (2000) descriptions of the interactions between the world and the mind to be really helpful. He describes two levels of relation – action (where the world is adapted to the mind) and knowledge (where the mind is adapted to the world). When this adaptation is incomplete or imperfect, desire and belief are generated. Desire drives our action to achieve a state of satisfaction, and belief drives our formulation of knowledge to find truth. While ultimately, we may strive for satisfaction and truth in all domains of experience, this is not practically achievable. We have to exercise an “economy of mental life” (Williamson 2000: p. 1), in which the relationship between belief, knowledge and truth is such, that we can work with ideas that sit at varying points along this belief-knowledge-

truth axis as though they were 'truths'. This supports my 'bounded rationality' understanding of truth, and helps consolidate my notion of knowledge as being valid.

Although using Williamson's (2000) axis of belief-knowledge-truth, we might now consider belief to be a 'stepping stone' to knowledge and truth, looking at the history of epistemology, there have been times when belief was seen as an alternative to knowledge. Particularly in the pre-Enlightenment period, when belief was strongly tied to religion, belief was seen as the poor relation to knowledge (Rorty, 1979). Philosophy, viewed as a scientific pursuit at that time, with its inherent claim to knowledge, was seen as a higher order of thinking. As a 'foundational' discipline, philosophy could verify the knowledge claims of any other domain of thinking.

Following the Enlightenment, this tension between religious belief and secular 'knowledge' became less pronounced. The focus was now on a burgeoning secular academia. Whereas previously, the philosophical validation of knowledge was required to counter religious belief, there were now many types of learning and knowledge that could fulfill this role. Philosophy was no longer the foundational bedrock that underpinned the 'truth' of disciplinary knowledge, it now merely provided an interesting counterpoint with which to review knowledge.

Habermas' reading of earlier writing by Max Weber (1948) on rationality, provides a useful reflection on this period of the birth of modernity. Habermas (1993) develops the idea that cultural modernity should be described as the separation of the 'reason' of religion and metaphysics into three autonomous spheres – science, morality and art. Science was the path to truth, morality showed the way to justice and art was the guiding force with relation to taste and aesthetics.

With this attempt to locate my ideas about knowledge and truth within a broader historical and cultural context it is easy to lose sight of the relevance of some of

these ideas to education. Habermas (1993) has suggested that during modernity, knowledge came to be viewed as belonging to one of three domains. We might easily see the birth of the modern disciplinary division of academic knowledge in this initial triad.

Moving forward still further into the post-modern era, Lyotard (1979) makes some interesting observations that I think reveal a development of Habermas' (1993) location of knowledge within these domains (or via my extrapolation, within the disciplines). Lyotard (1979) describes knowledge as a question of competence, which extends to three areas – efficiency (technical or scientific thought), happiness (moral and ethical thinking) and beauty (aesthetic and experiential critique). Whereas Habermas (1993) permitted knowledge to exist within any single area of his triad, Lyotard (1979) defines knowledge as requiring elements from all three of his competence areas, with none being privileged over the others.

These three conditions of knowledge or competences, map neatly onto Habermas' (1993) autonomous spheres (*figure 1*). Whereas Habermas was citing three types of knowledge that might exist, Lyotard is elevating knowledge from sitting within a single discipline, way of thinking or type of competence, to something that can only exist when these different strands are brought together and united in one confluous piece of thinking, perhaps suggesting that knowledge is not a disciplinary phenomena, but a higher order of cognitive processing that requires movement and exploration beyond the confines of a single discipline. Although our higher education system might aspire to the ideal of knowledge creation, it is largely structured to create disciplinary expertise in our undergraduates. The project of higher education is pressured by the need to create a base of disciplinary literacy, especially in science and engineering education that requires a high volume of technical information to be processed and integrated before 'knowledge' creation can begin to occur. I would suggest that perhaps disciplinary education should one be viewed as just one component of higher education, and that creating opportunities for students to think 'outside' their disciplines, and practice building knowledge for themselves is an

important secondary component. By teaching nothing, I think that I am inviting my students into a more neutral space where this can begin to happen.

Figure 1

Habermas' autonomous spheres of knowledge	SCIENCE		MORALITY		ART
	↓	OR	↓	OR	↓
	relates to truth (cognitive- instrumental)		relates to justice (moral-practical)		relates to taste (aesthetic-expressive)
Lyotard's competences required for knowledge	EFFICIENCY		HAPPINESS		BEAUTY
	↓	AND	↓	AND	↓
	relates to technical qualification		relates to justice or ethical wisdom		relates to aesthetic sensibility

Lyotard (1979) goes on to state that there is also an evaluative component to knowledge and I think that this is his own nod towards the idea of truth being a necessary component of knowledge. He says that knowledge should demonstrate some conformity to custom, opinion, or socio-cultural acceptability and it is this conformity that legitimates the knowledge. While this is a step away from the 'absolute' truth required by the likes of Plato, I would like him to go a little further. I would view a 'reflection on whether there is conformity' as a necessary condition rather than seeking conformity itself. In a world where knowledge is increasingly contestable (and I see this as a key component of knowledge as opposed to information or evidence which are non-contestable by their nature), there will often be lack of conformity or cultural acceptability.

As when questioning the nature of truth, I think the key questions about conformity relate to recognizing with whom we are trying to conform. Working with students to think about sustainable human development, the inherent notions of different cultural approaches to science, progress and knowledge reveal how much variability there is in these concepts, and how entrenched in a Western perspective we become without actively seeking the wider picture.

Knowledge, Science and the Reproductive Education

“Even if we could be learned with other men’s learning, at least wise we cannot be except by our own wisdom”

(Montaigne 1943: p. 122)

Historically, science has been a key contributor to knowledge and Lyotard (1979) acknowledges this in his exploration of knowledge in the post-modern context by elucidating the role that the methodology of science plays in our view of knowledge and teaching. Initially, science progressed by the verification of statements, and latterly by a process of falsification. If a hypothesis cannot be demonstrated to be false, it is taken to be true. Lyotard (1979) notes that this process relies on a second scientist with equal knowledge and experience as the first to attempt this process of falsification. Therefore, to ensure the survival of science as a method for understanding the world, you need to ensure a constant supply of new and ‘equal’ scientists.

This leads Lyotard (1979) to conclude that while research may be a dialectical process, teaching must be a didactic process. He goes on to note that science implies diachronic temporality, meaning that it is a cumulative process. You therefore cannot practice science without acquaintance with all previous statements relating to your area of enquiry. Therefore education, and particularly higher education (as a producer of research scientists), must provide an organized stock of established learning to students, to enable them to gain the status of an ‘equal scientist’ who can undertake and maintain the practice and process of science.

This idea of education as a process of reproduction – whether in its literal sense as described by Lyotard (1979), or whether as a problematic that perpetuates social inequality as described by thinkers such as Bourdieu (1990) and Aranowitz and Giroux (1991), is a common feature of postmodern critiques of education. These ideas might be pulled together as indicating that education is

dogmatic in codifying specific knowledge that is acceptable, and that this signifies 'correct' intellectual development.

From my own perspective this statement might operate at two levels. Education might be alleged to determine the correct repertoire of information; for which an individual might develop accomplished literacy; and from which an individual might generate their own knowledge and understanding. Alternatively, and more worryingly, education might try to dislocate discrete bodies of knowledge from their temporal-spacial-person-specific locations, and then package and deliver them as singular items to be learned. In this context, I have to agree with Montaigne (1949), and query whether knowledge can in fact be shared in this way.

An interesting term from linguistics might help to reveal why this is an impossible mission (at least while maintaining the integrity of the notion of knowledge). 'Deixis' (Lyons, 1977) refers to words and phrases that cannot be understood without additional contextual information. I think that knowledge exhibits deixis, and when presented without the context of the knower similarly cannot be understood as knowledge. Without this context, it therefore reverts to a status akin to information, increasing the dogmatic nature of this communication and conflating a complex, dynamic mass of information, imagination, opinion, experience and personal understanding into a single expression of fact. Indeed McArthur (2012) works to counter this potential criticism of the role of knowledge in education by suggesting that 'appropriate engagement' with knowledge in higher education, would value the complex, contested and dynamic nature of knowledge even though this makes education a more difficult and uncertain task.

Differentiating Knowledge and Information

“In true education, anything that comes to our hand is as good as a book; the prank of a pageboy, the blunder of a servant, a bit of table talk – they are all part of the curriculum”

(Montaigne 1999: p. 24)

Our consideration of knowledge and its relationship to education has now highlighted a difference between ‘information’ and ‘knowledge’. Defining these tricky concepts has occupied many great thinkers throughout history and it is impossible to achieve two uncontested definitions. However, Brown and Duguid (2000) use some of the conclusions we reached above as a useful way of differentiating knowledge and information. They state that knowledge: (1) “entails a knower”, (p. 119) (2) cannot be “shipped, received or quantified” (p. 120) and (3) requires “digesting rather than holding”. (p. 120)

To explore this a little further, let us imagine some trees. The fact of existence of the trees is clearly information. The trees exist whether or not I actually see or remark upon them. I can then become aware of the trees. I have learned that they exist. I have learned that there are 42 trees and perhaps the species of the trees. At this point, I still do not have any knowledge of the trees. However, if I run my hands over the bark and experience the roughness of their texture, smell the freshness of the leaves and consider the nature of the trees, I am working towards creating knowledge. I now view the trees as an area of woodland – a conceptualization that adds to the ‘information’ that the trees exist. This woodland provides a habitat for many species of wildlife. I am now integrating the information about the trees with other information about wildlife that I am already aware of. Gradually I am building a knowledge base regarding these trees. As I find out and experience more about these trees, that knowledge base will shift and change, and later as I find out more about climate change and carbon exchange, my knowledge will shift still further to work with other areas of knowledge that I have constructed. Someone else who has viewed these same trees, but didn’t touch or smell them, and who knows nothing about climate

change might develop a completely different knowledge regarding these trees, or might not reflect at all on the nature of the trees and might retain an awareness of the trees as information. Clearly this example is beginning to highlight what I believe to be the contextual nature of knowledge, and the part that experience might play in the transition from holding information to developing knowledge.

This train of thinking seems to present an accumulation of information as the process of 'learning' and the development of knowledge as a something altogether different. However, I think that this is where some further consideration of educational theory might help to elucidate some of the epistemological ideas. In a study of adult learners, Säljö (1979) documented five categories of learning:

1. An increase in the quantity of known information
2. Creation of a store of information that can be recalled at will
3. Acquisition of facts, skills and methods that are retained and used when needed
4. Relating subjects to each other and the world – making sense and finding meaning
5. Re-interpreting information to understand the world in new and different ways

The first three ways of learning clearly involve literacy, acquisition, accumulation and structuring of information. The final two categories go further than this. They imply integration of different types of information, finding meaning (which would seem to be a deeply personal and individualised aspect of learning) and finally using this to develop an increasingly sophisticated understanding of the world. These would seem to me to imply the generation of knowledge. Learning could be considered an axis of interaction with the world, where at one end there is a transactional interaction with the creation of an increasing repertoire of discrete items of information, and at the other end there is a more experiential form of learning (Kolb, 1983) resulting in a transformational interaction and the development of knowledge.

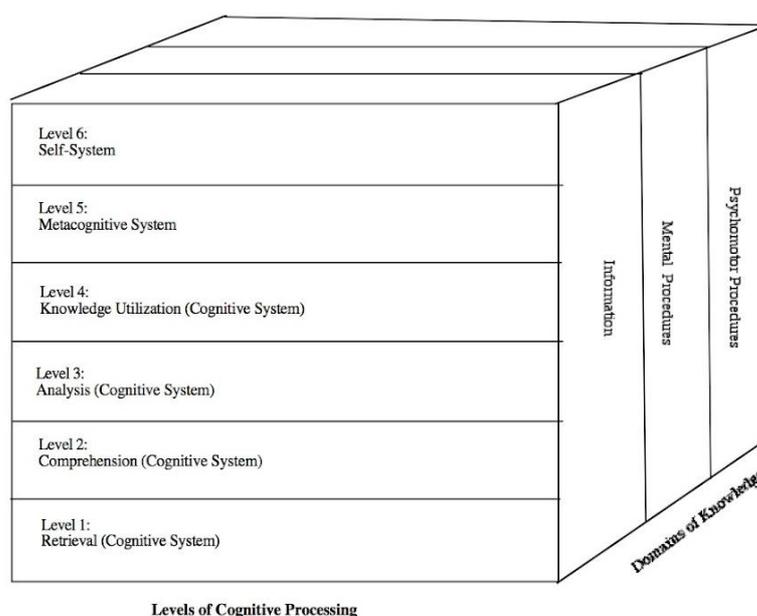
A further lens for viewing this difference in an educational context might be that of surface and deep learning (Marton and Säljö (1976), Ramsden (1992), Biggs (1993) and Entwistle (1981)). Acquisition of information might be considered as surface learning, whilst the construction of a body of knowledge drawing on diverse sources of information and other inputs might be considered deep learning. Of course surface and deep learning have the added characteristics of being driven by anticipation of application - surface learning is very much conducted in the anticipation of assessment. As a student you might explicitly be told what is to be assessed, but you might also make assumptions, based on collective student experience of constructive alignment – the curriculum development process whereby learning is structured to match assessment (Tyler, 1949 and Biggs, 2003). Students regularly make assumptions about what is required of them using a range of signals from the learning environment and provided materials – from stated learning outcomes to rumours from previous student cohorts.

Information delivery and acquisition is easy to assess and standardize, and therefore remains a popular and valuable part of the educational project. Knowledge development is much harder to assess. The personal and experiential elements of knowledge development mean that it is much harder to ascertain whether a certain standard of understanding has been achieved, although this is much easier in some disciplinary areas than others. Constructive alignment of knowledge generation is certainly harder to elaborate and maintain using traditional methods of assessment.

There would seem to be a basic repertoire of information that needs to be acquired to enable the more sophisticated and conceptual thinking that we might associate with the development of knowledge. We might understand this at a more fundamental level by considering how different aspects of learning might be structured in terms of their complexity or difficulty. Bloom's (1956) taxonomy is perhaps the best known ranking of these elements, but I find myself substituting his terms and adding caveats where none should be needed and

therefore prefer Marzano and Kendall's (2007) reworking of this early hierarchy (figure 2).

Figure 2. The New Taxonomy of Educational Objectives of Marzano and Kendall (location 461 of 4329)



It is interesting to note that knowledge features at level 4, and there are two still higher levels of processing that can be achieved. It is very easy to view knowledge itself as so problematic and difficult a concept to define and work with, that it seems this must be the ultimate pinnacle of thinking. However, what you do with knowledge once you have generated it gives us two further levels of complexity to consider. I particularly like that the three domains in this taxonomy use the same six levels as referents. It is also interesting that information is separated as a domain from the mental processes needed to deal with that same information. This distinction becomes especially interesting when considering the standardized assessment of something as diverse and individualised as knowledge (rather than information). Separating the process of knowledge generation from what has come to be known provides two avenues for assessment, and I certainly use both in my own teaching. It allows me to standardize some elements of the assessment (evaluation of the process of

knowledge generation – including research, evaluation of evidence, and assimilation of information and perspectives from a range of sources), whilst also recognizing the individual quality and nature of the ‘knowing experience’ and a shared evaluation of the ‘knowledge’ itself in as much as can be expressed through discussion and documentation.

Knowledge as a Social Entity

“It is good to rub and polish our brain against that of others.”

(Montaigne 1943: p. 136)

We have previously described learning axis that moves between information literacy at one end and knowledge development at the other. Northedge (2003) has written about the notion of knowledge in his work designing teaching for students of very mixed ability and prior experience. He has found challenges balancing the basic informational requirements of novices with the intellectual stimulation and conceptual thinking of more experienced learners.

Working from a socio-cultural perspective on learning, Northedge (2003) states that teaching enables students to participate in the act of knowing, and that students then become members of a discourse community (Swales, 1990). He further relates Swales’ idea of a ‘discourse community’ to Wenger’s (1998) ‘community of practice’, although I see a discourse community as being much more informal than a community of practice.

Northedge (2003) provides two different ways of identifying participation in a discourse community. The first is generative as opposed to vicarious participation. Generative participation involves contributing to and directing the development of ideas within the community, whereas as vicarious participants listen, read and consider things privately. Individuals may move freely between these two positions and at different times would naturally consider themselves more or less active participants. Revealing these two positions in this manner, Northedge (2003) pushes me to consider whether I value both of these positions.

I certainly recognize, reward and assess the generative contributions of students, but I think I have tended to see the vicarious participation of students as a 'lack' of generative participation, rather than valuing the progress and work that they might be producing privately. There is no obvious or direct way that I can necessarily address this, but it is something that I will consider in the future.

The second of Northedge's (2003) approaches is to look at types of understanding – and these he characterizes as convergent or variant. Convergent understanding loosely follows the shared understanding of the group, while variant understanding introduces individual perspectives and different ways of understanding key concepts.

This conception appears in the work of theorists who are thinking about similar issues but from a totally different perspective. Rorty (1979) differentiates these types of understanding as either knowledge perpetuating or knowledge generating. He would term Northedge's (2003) 'convergent understanding' as 'normal discourse', and 'variant understanding' as 'abnormal discourse'. This dichotomy might also be related to Thomas Kuhn's (1962) 'normal science' (where individual contributions from different scientists consolidate a shared understanding) and 'revolutionary science' (where a radical departure from a shared understanding introduces a new perspective that changes the course of normal science).

It might seem rather a leap to link these three conceptions, but as Aranowitz and Giroux (1991) state

“the tension between tradition and innovation plagues all who are seriously concerned with education” (p. 32)

I might therefore argue that variant understanding, abnormal discourse and revolutionary science are all concepts that warrant further delineation and study if we want education to produce independent thinkers who are capable of taking our civilization into the future safely and sustainably.

We seem to have moved now from considering knowledge in the context of the individual, to considering knowledge as a social practice. I have so far emphasized my own conception of knowledge as being highly individualized and personal, but I do agree that knowledge is a social practice. Borrowing Swales' (1990) notion of the discourse community, I think that each community can have its own, personalized knowledge base that is intimately known by the collective community. Equally, I feel that an individual may participate in solitary 'social' practices. I think that it is possible to have *communitas* within yourself, and that internal dialogue is critical for testing and developing your thinking, even when working closely with other people. Indeed Brown and Duguid (2000) state that knowledge may be viewed as a social phenomenon on the sole basis of the relationship between knowledge and the knower, and as noted previously it is this that distinguishes knowledge from information.

Knowledge as a Cultural Entity

"Knowledge is a good drug; but no drug is strong enough to preserve itself without alteration and corruption, according to the taint of the vessel that contains it."

(Montaigne 1949: p. 126)

We've considered here some of the 'social' aspects of a socio-cultural perspective, but rather neglected the 'cultural' elements. Working in a STEM institution, I feel that there is a dominant educational cultural force on campus, which might be described as a disciplinary pressure to 'reproduce'. This could be explained by Lyotard's (1979) ideas about science requiring an army of 'equals' to perpetuate the scientific method.

I certainly find that my students seem to work hard to develop literacy within their discipline and seem to strongly prefer the content heavy, information processing style of learning to the spacious and somewhat more vague opportunities to generate knowledge. Partly this is due to their previous

educational experience and stage of maturity, but partly it is due to the cultural expectation of a STEM student to be learning facts and truths that are either right or wrong. There is much less opportunity to develop critical thinking in an undergraduate engineering curriculum than say in a history curriculum. Additionally there is an efficiency imperative for STEM students. The volume of information with which they must become familiar is vast – and this engenders them to privilege time-efficient ways of learning. Time spent reflecting, imagining, arguing or digesting is time that is not being spent ‘learning’ information.

One way of considering this apparent cultural bias among my students might be to consider the disciplines as discrete cultural entities. The work of Neumann, Parry and Becher (2002) on framing the disciplines into hard, soft, pure and applied meta-fields of practice might be helpful to explore this a little. They describe ‘hard pure’ curricula (such as those found in the sciences) as being linear and hierarchical and refer to students progressing through the accumulation of much information in search of an ultimate level of understanding. Only later in their advanced studies do they come to understand that knowledge is dynamic and provisional.

I have been aware of this dynamic since I began working with STEM students, but I think I might have been mis-diagnosing this as a socio-biological phenomenon (a learning preference based on the abilities of the students) rather than a socio-cultural one (a learning preference based on the cultural experiences of the students). The idea that we need to understand the cultural pressures on our students to behave and learn in different ways is very important. We can use this awareness to better tailor our own approaches to offering them complementary ways of working that might lead them to develop a broader and deeper understanding of both their disciplinary work, and the world around them. Educationally speaking, this might sound rather obviously like making good use of Vygotsky’s (1978) zones of proximal development, but I had never thought of this in a cultural context before. Aronowitz and Giroux (1991) seem to agree and comment that

“curriculum can best inspire learning when knowledge builds on the tacit knowledge derived from cultural resources that students already possess”. (p. 15)

Encouraging students to participate in an atypical learning environment, therefore needs to be sensitive to the educational culture to which the students have become accustomed, and should work from this basis to help students incorporate new working processes into their learning identities.

Baxter Magolda (1999) neatly draws together a number of case series (Perry, 1970; Belenky, Clinchy, Goldberger and Tarule, 1986; King and Kitchener, 1994) that show how students progress from seeing knowledge as something certain to something uncertain during their undergraduate study. Taking the key points from each series, Baxter Magolda (1999) presents the ‘epistemological reflection model’ to detail this progression:

1. “Absolute knowing” (p. 43) – students see things as either right or wrong – repetition is the key to learning and if students remember information they can do well; the instructor is the source of authority
2. “Transitional knowing” (p. 45) – there is space for both certainty and uncertainty, but these spaces are predefined and static; learning shifts from remembering information to understanding it and students can do well if they can apply what they have learned
3. “Independent knowing” (p. 47) – there is a core assumption of uncertainty and everything is ‘relative’; instructors are now only one source of authority and knowledge is self authored using multiple sources
4. “Contextual knowing” (p. 50) – learners look at all aspects of an issues and draw together different types of expertise that come from specific and differing contexts to generate an integrated understanding that represents both their own and others’ views

Referring back to the Neumann, Parry and Becher paper (2002), this progression is clearly going to be paced differently in different disciplines. They state that in

less linear disciplines such as the humanities (or soft applied areas of study), students are often required to integrate complex, varied and contested perspectives within their subject area independently from the earliest stages of the course. This is often supported by visits to the same subject matter, with increasing complexity provided each time, akin to the spiral process delineated by Bruner (1967).

Viewing these ideas in the wider domain of higher education, we might view the linear pressures of information acquisition in science and engineering curricula as the dominant focus of disciplinary study. These disciplines, by their very nature, require situated, experiential learning for the generation of knowledge, but there is very little space for this to occur in a truly genuine sense, in the face of the vast body of information that must be acquired and processed at undergraduate level. Some measures of experiential learning might be used such as team projects and problem solving exercises, but these are confined within such a tight curriculum that the aspiration of genuine experiential learning does not transcend the reality of students engaging with these exercises in the same manner as with the rest of the curriculum. There is not the time or freedom for them to engage with the experience as individuals and for them to negotiate their own meaning and learning. Co-curricular programmes, which provide neutral extra-disciplinary spaces and alternative approaches to learning, might provide this crucial opportunity to practice the formulation and generation of knowledge in a more liberal and permissive sense.

One final perspective might provide further insight comes from transactional analysis (Berne, 1964). Berne recognizes the positions of child, adult and parent. Referring back to Baxter Magolda's (1999) epistemological reflection model, it is clear that the students move from the child position in the earlier stages, interacting with a parent-like teacher, to a more adult position in the latter stages.

For me, this is the last piece in the puzzle of knowledge in the context of my own teaching and it is something that I discuss explicitly with my students. When I

teach them nothing, and leave them an empty (but supported) space in which to determine their own topic of study, design their own project and ultimately develop their own knowledge, I am asking them to take responsibility for their own learning. I am removing myself from the position of authoritarian, expert teacher or parent and asking them to become their own experts, their own parents and their own teachers.

Conclusion

I began this essay with a quote from Montaigne that suggested that education was about filling the soul with learning, but we have seen that knowledge is not something that can be transferred or even 'learned'. Rather it is the product of a post-learning construction. I have referred to 'teaching nothing', 'leaving space' and creating a forum that liberates students to think rather than to learn. But is this the opposite of what Montaigne was advocating? I think he himself was conflicted on this issue and in fact the quote in it's complete form reads:

"I should be inclined to say that as plants are stifled with too much moisture and lamps with too much oil, so too much study and matter stifles the action of the mind, which, being caught and entangled in a great variety of things, may lose the ability to break loose, and be kept bent and huddled down by its burden. But it works the other way, for the more our soul is filled, the larger it becomes."

(Montaigne 1949: p. 118)

I think that Montaigne is mistaken in thinking that these two ideas are contrary. I whole-heartedly agree with both sentiments here. I think that in order to expand the soul, you do need to limit the 'matter' of learning, and allow time for construction of real knowledge. Montaigne values the diversity of his own educational experience and the time and space with which he was encouraged to tackle his own learning. I think he is showing an awareness of the importance of knowledge, and how this is different to developing literacy within a discipline. When students become so pre-occupied by learning 'facts', there is no time for them to indulge in actual 'thinking'. There is no time for reflection, integration

and deliberation. This is a great shame when it prevents students from creating knowledge for themselves. However, this is not to say that all education should be about knowledge generation.

As we have discovered, disciplines such as science are dependent on a cumulative process of discovery, and the perpetuation of the scientific method requires new scientists to be produced who are literate of this vast back catalogue of facts and deductions. There simply isn't time for each science student to come to understand each fact by a fresh process of discovery or contemplation. For efficiency, much of this material needs to be learned in a different fashion. For myself, coming from a background in medicine, I am aware of how much information I had to process, organize and store for recall. I don't think that I even began developing genuine knowledge until long after graduation when I started using these facts in a variety of contexts and began to 'experience' and 'know' them in relation to others, myself and the world.

I recognize the cultural pressure within a 'hard pure' or even 'hard applied' (Neumann, Parry and Becher, 2002) discipline such as science or engineering to devote the bulk of the educational experience to mastering the linear, hierarchical foundational basis of the discipline. However, I think it is important to recognize that these students may end up missing out on the time to experience thinking independently, constructing knowledge and developing personal insights into their work, which may just provide 'revolutionary' science (Kuhn, 1962) or true innovation. A holistic approach should be considered to ensure that students develop intellectual skills that they might not be exercising in their day to day learning, but which will be critical to their development as adults and participants in wider society. Therefore, in the project of higher education, I believe that we need to be thinking beyond the disciplines and embracing co-curricular, extra-curricular or other neutral learning spaces to allow this development in all our students. I therefore feel that I am justified to 'teach nothing' and consider my work to be a critical adjunct to disciplinary study in the STEM subjects.

The world is a richer place when you can come to 'know' it for yourself, by yourself and with yourself. Montaigne (1949) speaks of aspiring to the creation of able men rather than learned men, but I would argue that we need men who are both able and learned.

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