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Perspective Chapter: Changing the Educational Metaphors

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Abstract

Change in society is happening—change in knowledge, change in working practices, availability of employment (robotics and AI) and change in management. How is Higher Education responding to these changes? This chapter takes the view that the metaphors employed by educationalists play an important role. It is suggested that machine-based metaphors emanating from Newtonian thinking are now outdated and need to be replaced with ones based on the systems approach. The chapter identifies some common metaphors used by governments, HE management and HE employees. It then examines the consequences of changing them. The chapter does not promote a specific point of view but is intended to stimulate debate in this important area.

Keywords: metaphor, education, knowledge, system thinking, management of change

1. Introduction

This chapter is not written to promote my personal views of education but to encourage the readers to examine and analyse their own views. It is understood that the word "education" can mean different things to different people but any discussion on education must include one (or several) of the following: what is its aim, what it is doing and how is it achieved—purpose, parts, process.

The way we communicate is dependent on words, yet words can often be the cause of misunderstandings as words in themselves cannot always express the true meaning of an idea or a concept. One way of resolving this difficulty is to use metaphor and simile. A metaphor transfers meaning between contexts. In the expression, "*who holds the levers of power*" we are using the word" lever", which has a precise definition in mechanics, in a different context. The meaning of the metaphor is perfectly understandable, but it does suggest that "power" is a thing like a rock or an object that can be manipulated. The subtleties of all the relationships connected with power are not considered. A simile is different to a metaphor as it commonly uses the words "as" or "like" to make comparisons [1]. According to Bednar and Hineline, metaphors serve four major functions: influencing, perception, expression and learning [2]. They contribute to the formation of ideas and concepts and as a linguistic tool, are a powerful means of conveying, relating, transmitting and elaborating an intended meaning [3]. But a metaphor does not need to be stated with words. For example, the late-night diner scene depicted in Edward Hopper's famous painting *Nighthawks* is often interpreted as a metaphor for the loneliness and alienation of modern city life.

I wish to show in this chapter how all our views on education are shaped by the metaphors we use and use some of the more common metaphors to tease out different perceptions of education. Some of these metaphors are instantly recognizable but many are tacit. They are buried deep in our subconscious and are part of the web of our perceptions. For example, the "power is an object" metaphor is more like to resonate more strongly in a country where power is hierarchical and concentrated at the top than in an equalitarian democratic society. In this way, metaphors can be associated with the Ouroboros. The way we see the world is influenced by the metaphors we use and the metaphors we use are generated by the way we see the world.

Any perception of education is dependent on whether one is considering the societal or personal level. Metaphors can only be useful in the context they are set. In this chapter, we identify some of the common metaphors used in education and the consequences of using them. We will examine two broad classes of metaphor based around the idea of education as a machine and education as a process. The machine metaphor uses nouns such as controller, designer, driver, steersman, traveller, foundations and verbs such as fill, train, oil, polish, switch on, store, draw out, instil and package. The process (or systemic) metaphor employs verbs such as cultivate, plant, prune, tend, develop, root, seed, flowering, flourishing.

2. The machine metaphor

After Newton introduced the idea of gravity, it was found that the associated mathematics could explain many hitherto unrelated phenomena such as motion of the planets, the behaviour of tides and the fall of objects to Earth. This was the beginning of what is termed the scientific paradigm. At the heart of this thinking is the machine metaphor. Newton himself, who was deeply religious, compared the universe to a perfectly made watch where God was the watchmaker. This metaphor that equates efficiency to a well-oiled machine is deep in our modern psyche. One property of a machine is that it needs a designer, controller, driver. In this section, we will consider metaphors involving agents, forces or circumstances that exist exterior (outside of) the entity being discussed and which design, assign purpose to and monitor the behaviour of the entity. There are many metaphors that are used in this manner when discussing education. We will discuss four: "education as a journey", "knowledge as a commodity", "education as control" and "education as a building".

2.1 Education as a journey

One often sees references to an educational journey which begins at kindergarten and ends at university. A journey takes place over space and time. It needs a starting point, a route and a destination. Some routes may be well-trodden routes, but others need to be avoided. For this reason, it is useful to have a map, itinerary or a guide. I regard this metaphor as part of the "machine metaphor" because the journey is decided by outside agents, there is an agreed end point (the goal or purpose of the education) and a decision about the set of preferred steps to take, called the curriculum, which is equivalent to a map. The journey is decided in advance by the people in charge and one either reaches the destination (passes an assessment) or one does not. There is also extra kudos if one finishes quickly. Within certain stages of

the journey, some exploration is permitted but there always is a favoured knowledge which one is supposed to master.

What are the underlying assumptions here? Successful students are those that have attained a predetermined level of knowledge which has been deemed useful to the person or the society. As time passes, better maps are drawn, and new destinations are added to the itineraries so that the process is not entirely static, but the control is always external. The traveller has the freedom to choose a destination or take a different path to the norm, but the choices are predetermined. Korzybski coined the phrase "*The map is not the territory*" [4] as there is a tendency to conflate them. Any map is by its nature a simplification of what it is being represented. It is heavily dependent on context and the knowledge and experience of the user.

What is the final product of an education system—a good citizen? This links to the journey metaphor where the destination is suitability for employment and decided by the state. When neuroscience began as a subject area, the existence of connected neurons in the brain was regarded as a way of learning.. Donald Hebb used the metaphor "forming paths in the wilderness". The more people who used a path, the more prominent this path became. Thus, the more certain neurons were connected, the stronger that link would become forming knowledge. This is known as Hebbian learning and is fundamental to machine learning and neural networks [5].

A similar metaphor is that of a ladder. Many people see education as a means of climbing up the social scale. Possession of certain knowledge or attaining certain certificates (such as a degree) represents a rise in social status. One danger here is that of narrowness. A ladder can be adjusted to different terrains and reach different targets but once on the ladder there is only one way up and one way down. The steps on the ladder are fixed.. If one rung snaps, then one can be stuck on the ladder. A connected metaphor is that of a Glass Ceiling, which is invisible barrier which cannot be broken.

This metaphor allows for knowledge to develop in a logical, linear way but has difficulties with innovation. De Bono heavily criticises the use of the machine metaphor when discussing thinking. Using this metaphor, he compares thinking to digging a hole. The solutions to problems (commodities) can be found at the bottom of the deepest holes (which are inhabited by "experts"). Many times, new discoveries and innovations have been found lying on the surface away from the hole. De Bono expounds the aleatoric nature of innovation and shows that many discoveries owe a lot to chance. The rejection of the machine metaphor led him to the idea of lateral thinking [6].

At the societal level, one can see sense in the "journey" metaphor. If a community has an agreed, uniform perception of education, then administration is easier. At the personal level, I do not like the metaphor as it depersonalises the individual. Everyone has different talents, different objectives and different ways of learning. I taught for many years on the Open University Mathematics courses. Mathematics has always been regarded as a subject whose mastery had a linear progression. By this is meant that there are definite stages of understanding, and one cannot proceed to the next without mastering what had gone before. This is using the ladder metaphor. The Open University challenged this concept. It offered degree-level mathematics to students who had no previous mathematical knowledge! This was thought to be impossible, and I was originally extremely doubtful as to whether it could succeed. It did succeed, showing that at least in this case, the ladder metaphor was inappropriate.

2.2 Knowledge as a commodity

The most common metaphor for the past 2000 years is that of *knowledge as a commodity.* For example, we talk about intellectual property rights, buying and selling knowledge, storing knowledge, digging up the facts, building a foundation and spreading knowledge. In this view, knowledge is considered a collection of facts, which can be transferred from one person to another. There are many circumstances where previous knowledge is required for new knowledge so, in one sense, this is a useful metaphor as it prevents the reinvention of the wheel but there is a danger of knowledge becoming ossified and its transfer more of a habit than a meaningful objective. Whenever one regards education as the transfer (or transmission) of knowledge, then one is immediately (albeit tacitly) using the commodity metaphor. In a different context, electricity is *transmitted* along copper wires that are protected from external influences by plastic coats. To pursue this analogy, does education need to be encased it in laws to protect it from outside interference.

Transfer means to cross a boundary and thus implies the independent existence of an object. Thus, the commodity metaphor immediately defines an educator and a learner: the equivalent to the seller and the buyer If Commodities are seen as property, then property has value. One can see the rise of Guilds and the secrecy of the Alchemists as consequences of this metaphor.

Commodities are also concrete, quantifiable and measurable. When applied to knowledge, it becomes a collection of facts. But what is a fact? It is difficult to define a fact that is undeniable and true outside of logic and mathematics. According to Hannah Arendt, all factual truth is always contingent. "Facts are beyond agreement and consent, and all talk about them—all exchanges of opinion based on correct information—will contribute nothing to their establishment" [7]. Science draws its strength from the process of forming and testing hypotheses in order to arrive at factual proof. But facts are always empirically based and therefore depend on consensus. Thus, scientific truth claims to be objective but is really just consensus. Its claim to authority is that it is only true till it is falsified.

After 364 pages of complicated mathematics, Bertrand Russell and Arthur North Whitehead logically proved in their masterpiece "Principia Mathematica" that one plus one equalled two! [8]. They then developed the rest of mathematics which suggests that mathematics is in effect a large tautology, an ouroboros, where the theory explains facts that have been produced by the theory. It can be accepted that such "facts" exist in mathematics but in life it is more difficult to define a fact. In my lifetime, dinosaurs have been cold-/hot-blooded, fast/slow moving, hairy/smooth skinned. It is commonly believed that Henry VIII had six wives and that William was crowned the first Norman king of England in 1066. These can be classed as historical facts but, in many cases, history is written by the winner and there is always at least a smidgeon of doubt. Beliefs are different to facts. The commodity metaphor can lead to the productions of savants, that is people with detailed knowledge of facts but limited in their understanding of their significance. Other important questions are who decides which facts should be transferred and who they are transferred to.

Another attribute of a commodity is that it is quantifiable. It can be valued, measured and assessed. As humankind has delved more deeply into the nature of things, it has become increasingly difficult to measure accurately. This is most apparent at subatomic scales. It is now commonly believed that all measurements depend on context. A measurement is as much a function of the measurer as of the object being measured. When dealing with living beings, this measurement

problem is even more difficult as the object under investigation is not static—it is growing, developing, and remembering. In "education as a commodity", a common measurement is achieved by assessment. This then poses many problems. Is the measurement objective, that is independent of the assessor? What is the purpose of the assessment?—is it to test the efficacy of the system, the efficiency of the testers or the excellence of the learner? These are questions that must be addressed by educators and my thesis is that they are directly related to the metaphor that is being used.

A commonly used visual commodity metaphor is represented in a figure where the brain is a receptacle into which knowledge is being poured. There are many implications that can be drown from this. One is that learning is passive, and the brain is just filled with "knowledge". Another is that this "knowledge" is predetermined, agreed and administered by some third party. Who is the pourer, who chose the bottle, what does it contain? A third implication is that it is a finite process. Once the brain is full, then it can be closed, and the education has attained its purpose.

2.3 Education as control

In 1908, a famous chess match took place at the house of Maxim Gorki on the Island of Capri between Vladimir Lenin and Aleksandr Bogdanov. Both were active Marxists who had actively participated in the Russian Revolution. The chess match was the pretext for a discussion about the nature of the new Russian state. Lenin believed he could use the "education as a control" metaphor to impose compulsory and binding Marxist knowledge on the population. This meant that the content and pedagogy of Russian education should be legally enshrined to protect it from "subversive" theories. Thus, the state shaped its populace. Bogdanov disagreed and thought that, given the right environment, Marxist ideas would flourish through cooperation and agreement, that is the populace would shape the state. The decision was between a bottom-up or top-down approach to education. Lenin's top-down solution prevailed but then how could this be accomplished. This debate then moved to the effectiveness of central control

Most people would associate effective control with central control, but is this always true? There are many examples, especially in nature, where it is definitely not the case. For example, there is a species of leaf cutting ants called Octospinosis that forms colonies of around 50,000 individuals. They search out a certain leaf and cut it into fragments which they cultivate in a garden to grow a certain fungus which is their diet. They also develop antibiotics that protect the leaves from other fungi. They have a training system (a prototype apprentice scheme). They dig trenches around their nest that controls drainage and aeriates the soil and employ an effective waste management system. Every colony is founded by a queen but she merely breeds the ants. She is not a controller [9]. There are many interesting questions here concerning how this system survives, but it has worked well for millions of years without central control. There are many other examples in nature where the control metaphor is not appropriate. In fact, one can say that in nature, central control is not the norm.

It is not suggested that a human society should or could be run as an ant colony but it suggested that we can learn from nature. One can think of business organisations as lying on a continuum, which ranges from highly controlled (probably hierarchical) to self-organising where there is no controller. As an example of the latter, in 1998 Oticon was the third largest hearing aid company in the world with 10% of the market. The world market was stagnant, and the company was running at a deficit when they appointed Lars Kolind as the new CEO. Within a few years, Oticon became

the largest hearing aid manufacturer in the world. Ten years of stagnating sales prior to 1992 were turned into 14% growth in 1992 and 20% in 1993. He introduced revolutionary organisational structure that did not involve central control and for this reason was nicknamed the "Spaghetti Organisation" [10]. Development time for new products was halved and twice as many new products were put on the market. Some of the modernisations were as follows:

- all paperwork arriving at the company was photocopied and then shredded so it could not be stored;

- all work was in teams;

- employees had their own portable desk with a computer, and these could be moved together to form a group or a team

- when faced with problems, they were encouraged to "think the unthinkable" [11].

The "*education as control*" metaphor is still strong today. Control is explicitly linked to purpose. If the pedagogical purpose of a government is to ensure that all the population have a certain standard of education, then using this metaphor is an efficient way of achieving that goal. At the chess match, Lenin won the argument, Bogdanov was banished for 20 years and the soviet system was established. At the state level, many would argue that the metaphor was a valid one and the soviet education system worked. The Soviet people became well educated (in the "*knowledge as a commodity*" sense—they all had predetermined knowledge) and Russian scientists were well respected. However, at the personal level, the central control prevented people from taking decisions, innovative thinking was discouraged and individual freedoms were supressed.

State purveyors of education at all countries are trained to deliver what is regarded as a standard education. If everyone in a population is thinking differently, then there is always a fear of anarchy and civil unrest. The present school education system in England uses this metaphor. There is a board that sets the syllabus in every age group, in every subject. This is taught in every English school. There is no room for deviance. Even creativity is covered. In administration, it is an easy system to maintain, and it has an equalitarian aspect in that everyone is treated the same. The obvious disadvantages are that the "educators" decide what the commodity is and the students are simply recipients of the thing called knowledge. There is no recognition of diversity, development and growth. Is the purpose of education to control?

This metaphor also influences assessment. Standardised tests are devised to monitor the prescribed knowledge that has been delivered. I once had an acquaintance who proudly held a certificate proclaiming that he was sane. To me his need for this certificate indicated that he was not!

2.4 Education as a building

Another common metaphor talks about laying the foundations of knowledge and building educational edifices. Words such as bricks, pillars, windows and access to light are common. **Figure 1** shows a diagrammatic representation of an educational system, which uses this metaphor. The diagram is intended to show a
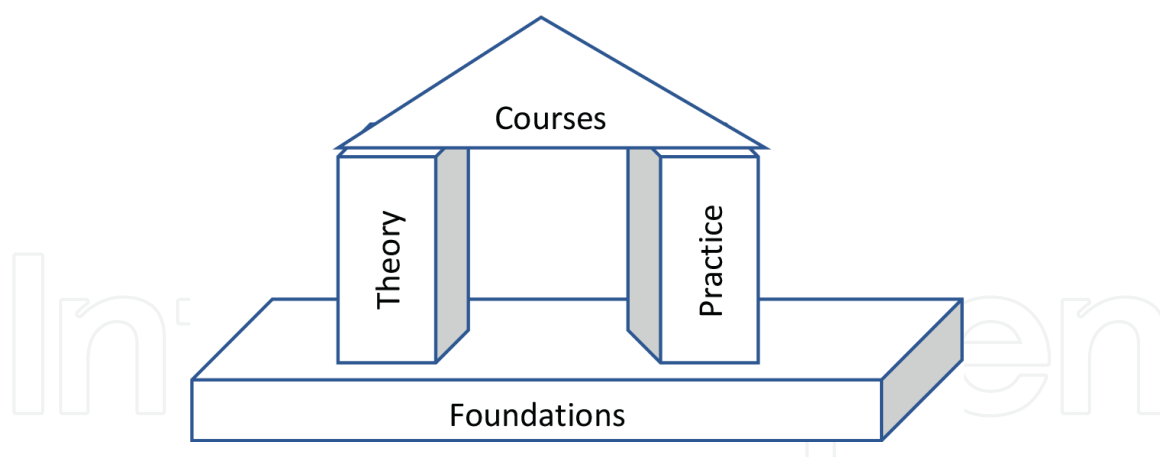
Figure 1.
Education as a building. Source: Author.

well-constructed course, built on firm foundations, with defined pillars of wisdom supporting the predefined knowledge. This is a first sight an appealing metaphor. Such a system could be well defined and work well in a particular context, but it suffers from all the faults of a machine metaphor. It is also inflexible and rigid. Physically, an earthquake could easily topple it and, when applied to education, would it survive sudden changes in policy.

3. The process metaphor

The process metaphor is associated with system thinking which is centred around the systemic ideas of process, relationships, recursion, emergence and holistic thinking.

"No man is an island" is a celebrated line taken from a sermon by John Donne, the Dean of St. Paul's in 1640. It uses a geographical metaphor to express the fact that people cannot exist independently from others—from humanity. It expresses very eloquently a basic belief of system thinkers—that the relationships between entities are more important than the entities themselves. In fact, many entities are only defined by their relationships.

Another fundamental systemic belief is the idea of recursion—that every system is embedded in other systems. This implies that everything exists in three forms: what it currently is, a collection of parts and a part of a greater whole. These three forms are termed levels of recursion.

Scientific thinking is reductionist. It divides the whole into parts, improves each individual part and then reassembles the parts into a new whole. For the whole to work effectively, each part must fit with/connect to other parts and work harmoniously together. In this sense, there is a relationship between the parts, but the difference is that in system thinking, the parts cannot exist independently without that relationship. The parts are interdependent. In the mechanical case, when one gathers things together and the whole equals the sum of the parts but in the systems case, new properties may be present in the whole that did not exist in the parts. The whole is not just the sum of its parts. This property is known as emergence and the emphasis on the whole is known as holistic thinking. This is a very different way of thinking compared to the scientific paradigm [12].

To illustrate the difference between system and scientific thinking, let us use system thinking to deconstruct the question "*What is Education?*"

- The second word "*is*" implies existence but at what level of recursion? Are we discussing its parts—curricula, teaching institutions, teaching or are we examining education as part of a larger process that has value either at the personal or at the societal level. As a system thinker, I do not accept that existence is an independent property. Everything consists of parts and is itself part of something; that is, it exists in to different guises—it is Janus faced.

- The fact that we use the third word "*Education*" implies that we all know and agree what education is (which makes the sentence tautological). But, as will be made clear, it is important to identify at which level of recursion "education" is being discussed.

- The first word "*What*" implies that whatever education is, it can be classified and measured. Plato posed the question of how we can know something that we do not already know [13]. Kant classified the world into the phenomenal and the noumenal. The phenomenal described attributes, whereas the noumenal captured the essence of the object and stripped of its attributes—the ding-un-sich—the thing-in -itself. He concluded that it was impossible to capture the noumenal so that all our studies were phenomenal and therefore open to debate and communication [14].

Several metaphors will now be discussed which are tacitly understood to have a strong connection to system thinking.

3.1 Education as a process

One talks of the educational process, of one's knowledge blossoming, of discovering new paths and new destinations, of creating new areas of knowledge, of growth and development. When education is seen as a process, it has no beginning or end. A process simply exists. Knowledge is whatever is needed for sustainability. Decisions are not decided by external forces but are generated from within. This is an entirely different to the "education as a journey or ladder" metaphor. It does not state starting points or destinations. A process is something that enfolds. It continues. Chance is always present. At the personal level, this metaphor allows individuality. Each person is sharing in a process but in an individual way. It does not function so well at the state level where the state is demanding certain knowledge. Again, one can see a connection with the metaphor of an ouroboros. Education is constantly eating its own tail. New ideas are old ideas repackaged for a new market; lessons are not learned; the past is forgotten, and the future is always new and exciting.

This metaphor uses the word "knowledge" as a verb rather than a noun. "Knowledge" is an action—doing or thinking or participating. This encourages cooperation rather than competition or hoarding. It has an emergent attribute which solves Plato's dilemma and explains innovation. Any knowledge is part of a higher knowledge (recursion). In this sense, knowledge develops. Knowledge is contextual. There is no true or perfect knowledge, just appropriate knowledge for the environment, which is being examined.

3.2 Education as a self-organising system

We have seen that lack of external or central control does not necessarily imply disorder or chaos. A system can be self-regulatory; that is, it has developed (not

been designed) to monitor itself and adjust its behaviour to enable it to survive. For Argyris and Schön, learning involves the detection and correction of error [15]. When one's results do not achieve the objective, the first reaction is to change the strategy. The new results are evaluated, and the strategy is modified. There exists a simple negative or self-correcting feedback loop, which is often described as "*single loop learning*". This can be an effective way of proceeding and is the basis of a homeostat such as the thermostat in your house but what is not questioned are the underlying assumptions—governing variables. If one applies a similar feedback loop to these variables, then we have what Argyris and Schon call "*double loop learning*" [15]. This is shown in **Figure 2**. Changing the governing variables will affect objectives and strategy. This is how Argyris and Schön described the process in the context of organisational learning:

> *When the error detected and corrected permits the organization to carry on its present policies or achieve its presents objectives, then that error-and-correction process is single-loop learning. Single-loop learning is like a thermostat that learns when it is too hot or too cold and turns the heat on or off. The thermostat can perform this task because it can receive information (the temperature of the room) and take corrective action. Double-loop learning occurs when error is detected and corrected in ways that involve the modification of an organization's underlying norms, policies and objectives [14].*

Usher and Bryant see similarities with this work and that of Aristotle when he was discussing practical and technical education [16]. Technical education is similar to single-loop learning insofar as if there are certain rules, routines and processes that are predetermined and must be followed. Practical learning relies more on reflecting on what one is doing, and this involves the double loop where one is always questioning and changing objectives. It also invokes the learning stages proposed by Gregory Bateson [17]. Single-loop learning equates with learning stage one which he terms machine learning. Double-loop learning equates with learning stage 2 which he terms "learning to learn" referring back to the "education as control" metaphor and for the debate between Lenin and Bogdanov, one could say that Lenin was advocating single-loop learning, whereas Bogdanov, who is regarded as the first cybernetician, was advocating double-loop learning.
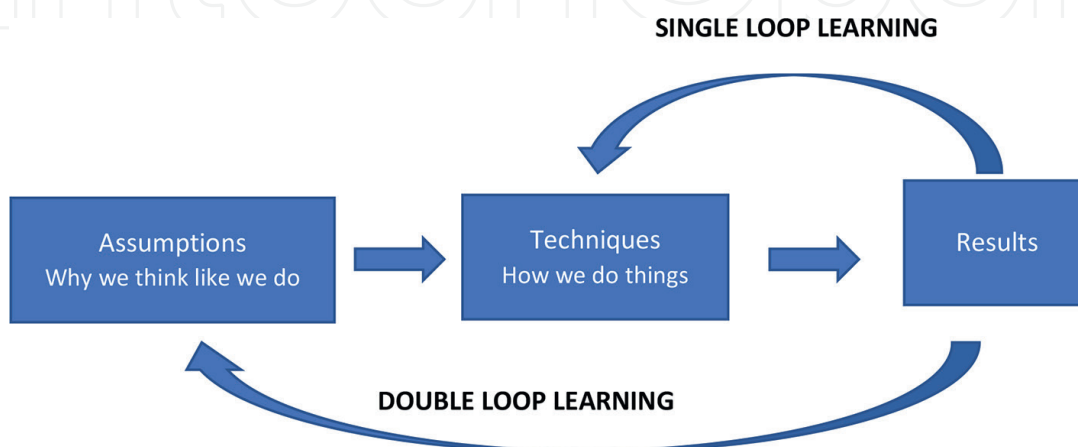

Figure 2.
Double-loop learning.

All systems are defined by their environment. The boundaries that are defined create a space without and a space within. Over time, the system itself will develop a set of values and principles which will establish a culture—an organisational structure. This structure is specific to the system and is controlled by the system. When the environment changes (which will be often), the system should, through its communication channels, recognise these changes. It can then evaluate them and decide how or whether to use them in its organisational structure. The important fact is that it is the system that affects the internal change not the environment. The system is in charge of its own destiny. Control is from within rather than imposed. It is structurally open, but organisational closured. Such a system is a special case of a self-regulatory system and is known as a Complex Adaptive System (CAS) [18].

There are many misapprehensions connected with self-organisation. One interpretation is that an effective CAS relies on motivated and committed individuals who will commit their time to make it work, thus making it a costly venture. But it is the opposite that is true. There will be transitional costs in setting up the educational system as a CAS but once running, it will control itself and therefore save on costs. However, it is recognised that human societies are extremely complex and there will be difficulties, as seen by social media platforms, in self-regulation and misinformation.

3.3 Education as a garden

This is the systemic equivalent of the "education as a building" metaphor. The difference is between a gardener and a builder. A good gardener tends to the garden. He allows it to grow and flourish. It is true that the English Garden of the eighteenth century was planned and controlled. I am referring to a wild garden that is protected against disease and storms but allowed to grow freely. One can see the attraction of this metaphor in the development of personal education and indeed this was the theory behind the international movement for progressive education, which began before the turn of the century. There were reformers in the United States, like the educational philosopher, John Dewey. In Germany, Paul and Edith Cassirer-Geheeb founded the Odenwaldschulei [19]. In Italy, Dr. Maria Montessori developed a method of teaching young children through structured lessons using attractive equipment that she herself designed. Montessori showed that pupils were quite capable of learning on their own with the help of a teacher as a guide or mentor. They responded well to the opportunity to choose what to study and the manner in which they do it. This is not popular among educators as it is much more difficult to assess and is much more time consuming than traditional methods [20].

The modern education system using the machine metaphor decides on the content of the knowledge, the method which this will be imparted and it can easily produce knowledgeable robots with no adaptability to different circumstances. Maybe, this new metaphor needs to be considered.

3.4 Education as evolution

Darwin talked about the struggle for existence, but in 1865 Herbert Spencer coined the phrase "survival of the fittest" to describe the mechanism in Darwin's evolutionary theory [21]. This is unfortunate as evolution has become associated with competition but in many cases, species survive through cooperation. Recent research into forests have revealed that trees form communities through their roots. Messages

are transferred and older trees look after younger trees. Forests that are replanted with only one species are not as active as those with different species. There is clear evidence that trees cooperate [22]. The researcher Lin Ostrom has recently received a Nobel prize in Economics for showing the cooperation is a better strategy for companies and businesses than competition [23].

Applying these ideas to Education will involve the concept of team learning. Some benefits of team learning are self-awareness, respect for others, the capacity to plan, negotiate, compromise and consider, to take orders and follow them, and to make suggestions and follow those too. By doing all this, invaluable leadership skills can develop.

Encouraging students to work together can allow "emergence", that is, results that would not be achieved individually and cannot be predicted. This is a disadvantage when devising an assessment procedure. It can be difficult to assess the individual contributions to a group. One advantage of standard examinations is that they are marked against an agreed answer. It is time consuming to assess a piece of work that was not predicted. Current education practice, even when using the mechanical metaphor, is beginning to incorporate team learning but the assessment process is still very much examination centred.

3.5 Education as communication

We have discussed the transmission metaphor of "*knowledge as a commodity*" but how else can knowledge be disseminated. Another metaphor uses the concept of communication—using the unique features of the human language. In this regard, there are two words which I would like to deconstruct—discussion and dialogue.

The etymology of the word "discuss" is from the past tense of the Latin verb "Concutere" meaning to violently shake or dash together. Words with similar roots are percussion and concussion—all with the idea of things bumping into each other. This leads to metaphors such as "standing ones ground", winning the argument" and "taking a position". In contrast, the word "dialogue" comes from the words "dia" and "logos", which implies from or through the word. There is no implication of competing or winning. This is the basis of David Bohm's work on Dialogue which is a process for exchanging views and thereby educating ourselves [24]. Bohm's work is similar to the work of the Russian scholar Mikhail Bahktin who Kim calls "the philosopher of human communication" [25]. He argues that "*Bakhtin's theories of dialogue and literary representation are potentially applicable to virtually all academic disciplines in the human sciences*" [25] According to White, Bakhtin's dialogism represents a methodological turn towards "*the messy reality of communication, in all its many language forms*" [26]. Kim also states that "*culture can be generally transmitted through communication or reciprocal interaction such as a dialogue*" [23]. Baxter states "*a dialogic perspective argues that difference (of all kinds) is basic to the human experience*" [27]. These references imply that any communication is heavily dependent on context. For a communication to be effective, the communicator must be aware of the background and culture of the person that is being addressed. There must be an awareness of any hidden or ambiguous meanings. For instance, the world "control" has a very different meaning in former Soviet countries to the softer meaning (akin to organisation) that is adopted by system thinkers. Communication need not just be by words. Art has been as a communicating medium. Picasso's Guernica is now universally accepted as a protest against totalitarianism and currently, Wei Wei's art is seen as sending messages to the current Chinese government.

Adopting this metaphor of "education as communication" could involve a greater emphasis on what are termed "soft skills" of which one is the ability to express oneself. At universities in the Middle Ages, as part of their education, students were encouraged and taught "in utramque partem", which means to argue for both sides of a proposition. This recognises the arbitrariness of facts as mentioned earlier and reminds one of a forgotten part of education—rhetoric. Rhetoric is the study of how to communicate effectively in speech or writing. This could be made an important part of any educational process and would aid in the understanding of cross-cultural differences.

Applying these ideas to Education will involve the concept of team learning There are many benefits of team learning such as a greater awareness of oneself, an understanding and respect of the views of others that will lead to negotiation and compromise, self-reflection and an appreciation of the qualities of leadership. Encouraging students to work together can allow "emergence", that is results that would not be achieved individually and cannot be predicted. This idea is predicated on "holistic thinking" and "recursion" that are key concepts of system thinking. For a culture that is dominated by the machine metaphor, the behaviour of the whole is always presumed to be the sum of the behaviours of the individual parts but the system metaphor places the whole and the parts on different levels of recursion. Thus, the "team mind" is not simply an accumulation of the minds of the team members. It is certainly the case that the "team mind" can come up with beliefs which can be true or false. The ouroboros appears again—the experience and interaction of working in a team shapes the views of the individual members but then these views shape the view of the team.

Working as a team can cause difficulties when devising an assessment procedure. It can be difficult to assess the individual contributions to a group. One advantage of standard examinations is that they are marked against an agreed answer. It is time consuming to assess a piece of work that was not predicted. Current education practice, even when using the mechanical metaphor, is beginning to incorporate team learning but the assessment process is still very much examination centred. The machine metaphor rests on the assumption that everyone should share the same beliefs else disorder would result. This implies an arbitrator of what is acceptable and what is not (Newton's watchmaker). But this neglects the community. People form communities where, whatever their beliefs, they share values of behaviour. So, they are the arbiters. This is surely the basis for a multi-cultural society that allows different beliefs to coexist.

4. Is a change of metaphor needed?

It is undisputed that to prosper any society needs to produce new generations of workers whose responsibilities are to maintain values and economic standards. This was the Lenin-Bogdanov debate discussed earlier. How this is achieved depends on the goal. If the goal of the education system is to ensure that its population has a predetermined set of skills, then organising a centralised, prescriptive system with regular standardised testing and maintenance is an efficient and cheap option and this will utilise some form of the mechanical metaphor. If the goal of education is to develop in innate, latent talents in individuals then a much more flexible approach (using the system metaphor) are needed. This will be more expensive to run and at first sight more complex unless the system is made self-regulatory. Individuals who have self-knowledge and belief and have studied areas that they are interested in

in their own time and manner will then be able to contribute to the society that has provided the educational environment.

The school educational journey is England is determined centrally. The national curriculum is a set of subjects and standards used by primary and secondary schools so children learn the same things. It covers what subjects are taught and the standards children should reach in each subject. Other types of school like academies and private schools do not have to follow the national curriculum but must teach a broad and balanced curriculum including English, maths and science. The national curriculum is organised into blocks of years called "key stages" (KS) that cover from preschool to 18-year-olds over 13 years. At the end of each key stage, the child's performance is formally assessed. The key stages are Early years (year 1–2), KS1 (yrs 3–6), KS2 (yrs 7–9)), KS3 (yrs 10–11) KS4 (yrs 12–13). Academies do not have to follow the National Curriculum, so they have much more flexibility about what they choose to cover. However, academies do have to teach a "broad and balanced curriculum", including English, mathematics, science and religious education. Ofsted (the UK regularity authority) will inspect them just as it would a maintained school [28].

The metaphors used by the present school curriculum tend to preserve a certain view of the UK, which is now being challenged on grounds of diversity, colour and colonialisation. For example, many books contain no persons of colour, and the prevailing view is that, in the main, the British Empire was a force for good. It is culturally biased towards a white, male Britishness which may no longer exist. In one sense, this does what all centrally controlled systems do—preserve the status quo and cohesion but it limits the provision of new views. Although within this national system, certain attempts are made to allow minor digressions, the whole system is designed to turnout the maximum number of people with basic knowledge in the cheapest way.

One can concede that the mechanical metaphor will generate an easier system. Events may have many causes—not just a single one and everything is interconnected. A more varied system will demand teachers with different skill sets, which may not be available. There is a demand for certificates and any system that does not generate them will not be favoured by the populace. Also, the government has to account for money spent and this is a way of showing value for money. These are serious considerations, but they deflect one's attention from what it is that is happening. School education must be focussed precisely on those areas that are the least valued today in society—in the systematic promotion of diversity and creativity.

We can apply the same logic to the Higher Education Sector. What is the purpose of a university? [29] It seems that today it is to award degrees which then can be used to gain employment—a perfect example of education as a commodity. A problem is that in this fast-moving global world, many of the courses are out of date and the skills of are graduate do not match the desires of the employers—the so called "skills gap". Using the machine metaphor, a centralised system can never bridge this gap as the new skills are unknown at the time of the determining the curriculum.

Many new skills are emergent and can only be achieved when using the system metaphor. This has implications for change. Systems are constructed to coexist with their environment and tend to resist change. Thus, when contemplating changes in the educational practices, one should examine the metaphor that is being used. Sudden change (shocks) or constant change in society can cause tensions, but most people accept change as part of life and are not resistant to it. The mistake is to try and change people rather than the metaphor. A complex adaptive education system will acknowledge societal changes and will itself change its organisational structure. When this changes, the behaviour of the people in it will change. What is needed is a

new metaphor that generates momentum in a new direction. Both scenarios recognise that the educational system cannot remain static and must change. The question is who or what makes the changes.

Is there a need for assessment? Although project work is becoming more popular, the high majority of university assessment is by examination. This is a product of the machine metaphor in that does the machine is doing what it is designed to do. If university education is designed to reproduce the existing knowledge, then examinations are ideal. Even when examination questions ask the student for his own opinions, these opinions are assessed against the perceived wisdom. In a stable, non-changing world, this assessment procedure worked well but is it applicable to today?

It is one thing to make passionate pleas for change backed up by persuasive reasoning. It is more difficult to detail how the changes can be implemented. There are clues from the past. Piaget's theory was that there are levels of understanding and that people will not learn unless they are mentally at the stage to understand what is being offered. If someone does not understand a concept, it does not imply stupidity but maybe that the learner is not yet ready for that learning. People must understand WHY they need to know before they learn to know [30, 31].

There a have been several attempts by schools to change the metaphor. A.S. Neill, the founder of Sommerhill, set out to make a school that would fit the child rather than forcing children to do what the parents and education thought best for them. He was rejecting the machine metaphor and edging towards the gardening metaphor.

> *"This expectation that everybody will achieve academically is a curse to many young people. "Parents should try not to have the expectations of what or who their children will become. You cannot decide whether they will be a road sweeper, a great surgeon or an opera star. Children need to know that their parents are on their side, acting as their champions"* [32].

The aim of life, according to Neill, was "to find happiness, which means to find interest". Likewise, the purpose of Neill's education was to be happy and interested in life and children needed freedom to find their interests which he felt came organically and spontaneously as a prerequisite for learning. Neill considered happiness an innate characteristic that deteriorated if children were denied personal freedom. Such unhappiness led to repressed and psychologically disordered adults. Neill believed that the best thing teachers could do was to leave children alone to develop naturally. Sommerhill was heavily criticised mainly for its attitudes to sex and freedom but it still exists today after 150 years. I am not arguing for every school to be like Sommerhill but am merely pointing out that there are different ways of organising schools using different metaphors.

5. Conclusion

Ever since the first recorded academy was established by Plato in Athens in 387 BC, the exact nature and function of education has been discussed. The purpose of Plato's academy was to produce an "educated man"—a citizen of Athens. My view, in this chapter, is to suggest that the metaphors in use have a major influence on how education is perceived. Underlying Plato's Academy was a biological metaphor in the sense that it used a combination of the following:

"Savoir d'etre"—**WHAT** exists—understanding and meaning (brain);

"Savoir faire"—**HOW** to do it—vocational training (hands);

"Savoir vivre"—**WHY** we do it—recognising one's place in Society (heart).

The balance between these three roles was thought to give birth to Wisdom. The curriculum was divided into the "trivium" consisting of Grammar, Logic and Rhetoric (teaching how to express oneself and one's ideas) and the Quadrium consisting of Arithmetic (for Finance), Geometry (Geography), Astronomy (knowing one's place in the Universe) and Music (achieving inner harmony).

This chapter has classified some common metaphors under the broad headings of mechanical and process. The mechanical metaphors have their origins in the scientific paradigm that has been prevalent for the past 300 years. It is particularly prominent in STEM subjects. Much of Science builds on what has gone before and therefore the metaphor of passing "knowledge as a commodity" to the next generation is a useful one. It prevents reinventing the wheel and ensures that knowledge is not lost. The metaphor of "education as a journey" is also in evidence as one talks of advancement of knowledge. This places knowledge on a linear progression where some facts are regarded as better than others. But these comparisons are often on a one-dimensional scale and ignore other considerations. Are mobile phones an advance on a telephone? It depends on the criteria used. The scientific paradigm is currently being challenged by the system paradigm, which forms the basis for what I term "process metaphors". Here, the emphasis is on growth and development. Relationships are important and communication plays a larger role. It concentrates on "learning to learn" rather than an accumulation of facts.

Society needs both academics and practitioners. Most higher education institutions are judged on their research and publication records (such as the Research Excellence Framework). A practitioner draws from a different well called experience and involves a different form of education, which could be termed vocational or training. It uses different metaphors such as action learning and learning by doing. Initiatives such as the Teaching Excellence Framework and Graduate Level Apprenticeships are being introduced to remedy this. A very recent development is that of pracademics who work in both fields. By doing so, they are able to gather and leverage knowledge and experience from both domains.

The hope is that the readers of this chapter will now examine the metaphors, tacit or explicit, which colour their perceptions of education. I leave you with a final metaphor by Plutarch (45 AD).

The mind is not a vessel to be filled but a fire to be kindled.

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