Human Activity Systems: A Theoretical Framework for Designing Learning for Multicultural Settings

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ABSTRACT
In the analysis of any learning environment, whether small or large, one observes within it a “set of human activities related to each other so they can be viewed as a whole” (Checkland, 1981, p.47). If one particularly focuses on large technologically driven learning environments, and then considers the many layers of complexity comprising the human activity systems within them, it becomes apparent that one of these layers, or subsystems, is a cultural one. This paper proposes that the perspective gained on the impact of culture in such a system by the application of Kline’s (1995) systems theory, augmented by perspectives supplied by world view theory, is helpful in designing appropriate learning environments for multicultural settings.

Keywords
Culture impact, Human activity system, Learning environment

Introduction
Issues of culture and world view and their impact on learning and working in engineering, science and technology have become increasingly important to practitioners and teachers. Academic institutions and their faculty members are seeking to examine their own cultural makeup, and the potential impact of this on growth or expansion, particularly in the area of global online learning environments.

This is best illustrated by example. Imagine an Australian university is considering expanding into the Chinese market as a joint venture with partners from other cultures. What are the cultural implications for the Australian University? What possible difficulties will they face? How does the University begin to analyse the role of culture within its own physical and electronic learning environments.

This paper examines the human activity within a learning environment as a system and uses a systems approach to analyse the role of culture within it. It also takes the perspective that a student or human agent is a product of the learning environment, so in this analysis a strong reliance is placed on modern theories of teaching and learning as expressed in the academic literature of science, mathematics and technology education.

Analysis
A Learning environment as a system
A learning environment can be seen as a complex socio-technical system, since it can be idealised as an open system that depends on the technology, the sentiments of the members, and the organisational environment (Checkland, 1981). Although the system is organised to focus on a primary task (the learning) this cannot be separated from the environment and the social factors, including cultural ones. Checkland notes that a reasonable method for gaining an understanding of such a system is to produce an overview of the system from several perspectives.

Others have expressed this same understanding of learning environments as complex socio-technical systems in the application of Activity Theory, based on the work of Leont’ev (1978) and other Russian psychologists, to provide a foundational perspective within Human Computer Interaction. Nardi (1996) conceptualises human activity as an integrated and hierarchical structure of dynamic and conscious goal-directed actions. The human actors are seen as working within a broadly objective, but socially and culturally defined, reality. Their activity is
itself mediated by tools, which are developed and transformed during the activity, and which themselves are culturally biased.

Complex Systems

In dealing with problems involved in understanding complex systems in general, Kline (1995) suggests that it is helpful to consider several different perspectives of a complex system. Kline (1995) maintains that three foundational perspectives of a multifaceted and hierarchical system are a synoptic, a piecewise and a structural perspective.

A synoptic view is an overview with a top-down approach for extracting and synthesising system property. A piecewise view is one that identifies and examines the smallest portions of a system that might be relevant in providing information to aid in the solution of any particular problem within the system. A structural view is one that provides details of how each piece fits together within a particular system as well as providing information on the relationship between local and global effects within the system.

Others have dealt with complexity in more specific learning systems contexts in a similar manner. Cognitive flexibility theory addresses the character of learning in complex and ill-structured domains. Spiro & Jehng (1990) state: "By cognitive flexibility, we mean the ability to spontaneously restructure one's knowledge, in many ways" (p. 165). Their theoretical focus is concerned with transfer of knowledge and skills beyond their initial learning situation. For this reason, emphasis is placed upon the presentation of information from multiple perspectives and the importance of the individual construction of knowledge within a specific given context.

Definitions of Culture and World view

In examining issues of culture and the ensuing problem of multiculturalism and the merging of cultures within a system, it is necessary to arrive at working definitions of each of the terms. Culture is a concept that is often discussed in academic literature. Definitions of “culture” have originated in two general domains: anthropology and ethnography and political empowerment.

Anthropology and Culture

A definition of culture found in early anthropological literature is that it is the “knowledge, belief, law, morals, customs” (Tylor, 1871, p.46) that are passed one from on generation to another within a particular society or group of people. Anthropologists of Tylor’s generation were expected to examine a “civilisation” and produce a taxonomy with categories such as weapons, textile arts, myths, rites, and ceremonies.

Civilisations and enterprises have become much more complex during the twentieth century, and anthropological concepts of culture have been applied in many fields of study, including nursing, studies of policing and factory work (Van Maanen 1995). The definition of culture has thus been extended, and described in many complex and diverse ways. Van Maanen comments (1995) that there is still considerable debate concerning “the sacred heart of ethnography, the culture concept”. Postmodernists and deconstructivists also have problems with the concept of discrete and finite cultures and an incredulity towards metanarratives (Lyotard, 1984). Others regard the concept of culture as something left over from a colonising era (Fabian, 1983).

The definition of culture that is most commonly found in the literature of science and engineering (Cobern, 1991; Waldrip & Taylor, 1995) is that of Geertz (1973) who indicates that:

The concept of culture I espouse ... is essentially a semiotic one. Believing... that man is an animal suspended in webs of significance he has spun, I take culture to be those webs, and the analysis of it to be therefore not an experimental science in search of law but an interpretive on in search of meaning (p.3).

Geertz’ definition is one which proposes that a person’s knowledge of his or her world, is essentially mediated by signs, and it is the structure of these signs which establishes reality for an individual or a group. In seeking to
identify cultural effects, one is therefore looking for contexts in which individuals from different countries or groups will respond in different ways to, or provide different interpretations for, the same sign.

**Political Empowerment and Culture**

Another definition of culture that is common among educators is that of a “straightjacket fashioned by irresistible societal forces” (Taylor, 1994, p.156). There is a link also between this notion of culture and multiculturalism, and the ensuing effect of multiculturalism on society. Giroux’s understanding of culture in this domain is one that is widely accepted in education and is that “culture is reduced to a type of monumentalism and the pedagogy through which it is expressed is organised around the process of transmission and the practice of moral and political regulation” (Giroux, 1990).

Within the literature of science education, especially when dealing with issues of multiculturalism, the definitions of culture become blurred. Some researchers adopt a critical perspective on the explication of culture from anthropology and Geertz’s (1973) “webs of significance” become interwoven with the politicised “straightjacket” of the system, as expressed by Giroux (1990, p.84).

**World View and Culture**

The concept of “culture” is strongly linked to that of “world view”. The term “world view” (Cobern, 1991) has two different connotations in English. The first has a philosophical meaning and involves a person’s concepts of human existence and reality; the second is an individual’s picture of the world. The term “world view” as used in anthropology refers to the “culturally-dependent, implicit, fundamental organisations of the mind” (Cobern, 1991, p.19).

Kearney’s (1984) model of world view presumes a logical and structural integration of presuppositions within any individual. Kearney’s perspective is an important one to educators since, within the author’s experience, it the most comprehensive model which has been drawn from the literature of cultural anthropology literature and applied widely in science education.

With this presumption then, Kearney (1984) identifies seven logico-structural categories contained within a given individual’s world view.

- The Other;
- Classification;
- Causality;
- Relationship;
- Self; and
- Time & Space.

These categories serve as a framework for analysis of a world view. Kearney (1984) draws the parallel between these factors of an individual world view and the categories a doctor uses for the diagnosis of a patient’s disease. In order to determine the world view of an individual, it is necessary to identify the way an individual understands these seven categories in order to produce a picture of that individual’s world view.

**Multiculturalism**

Multiculturalism has become a highly politicised issue in Western society. D’Souza (1995) sees that:

> the debate about multiculturalism is not over whether to study other cultures but how to study the West and other cultures. Multiculturalism is better understood as a civil conflict within the Western academy over contrasting approaches to learning about the world (online).

Several science educators deal with aspects of the politicised concept of multiculturalism, particularly within American society, and its effect on pedagogy. Stanley and Brickhouse (1994) argue that multiculturalism is an issue that is central to modern educators, and one that is challenging the basic underpinning concepts on which science educators build their modern curricula. They state that “Multiculturalists are raising questions that pose a
fundamental challenge to those traditional forms of knowledge that have assumed Western canonical thought ought to compose the core of school curricula” (Stanley & Brickhouse, 1994, p.387).

In reading the work of non-Western science educators, one finds that with the development of the Science, Technology and Society (STS) perspective in Western science education (Yager, 1980) there has been a stream of research from Asia and Africa that emphasises their non-Western socio-cultural viewpoint. Ogawa (1986) commented that a STS perspective did not always provide a comprehensible explanation for non-Western science education because it may not be immersed in a society that is primarily based on science and technology. He suggested that, for non-Western societies, the term “society” needed to be replaced with the concept of “culture”. He proposed a model for a rationale of science education that could deal with the interaction of traditional culture and western culture.

Ogawa’s (1986) model can be summarised as follows:
- Science should be viewed in a cultural context and, consequently, be relativised.
- Science as a culture should be seen within the context of the students’ traditional culture.

Ogunniyi (1988) tried to bring together the conflicts between a Western and an African world view. His argument was that although Western and African sciences both deal with the issue of interpreting the natural world, they are founded on divergent abstract models. “Science is based on a mechanistic explanatory model, while the traditional world view is based on an anthropomorphic explanatory model” (Ogunniyi 1988, p.6). His solution was that further studies should be attempted to determine the traditional view of various cultures and determine areas of shared understanding. With this shared understanding as a basis, and with an understanding of potential conflict, the science education curriculum could then be determined.

Jegede (1994) also saw many cultural factors involved in the teaching and learning of science; these included a traditional world view, societal expectations and the extent to which a society holds magical views incompatible with Western thought. In respect to the STS movement and its implications for African science education, Jegede (1994) commented that the best way to improve science education in Africa involved the application of situated learning with sensitivity to local culture, to facilitate learning science as understood in western society included:
- generating information about the African environment to explain natural phenomena;
- identifying and using indigenous scientific and technological principles, theories and concepts within the African society; and,
- teaching the values of the typical African humane feelings in relation to, and in the practice of, technology as a human enterprise (Jegede 1994, p.130).

A commonly held and more recent view is that of modern science, and science education, as a subculture within Western society. Ogawa (1999) sees Western science as a foreign culture for non-Westerners, and refers to Aikenhead’s (1996, 1997) metaphor of the “cultural border crossing” in picturing the student from an indigenous background taking part in the process of learning modern science. He explains that each culture has its own “personal” science and that it is difficult for some students to “cross” to the closed culture of modern science.

Jegede and Aikenhead (1999) also look at the implications of “crossing cultural borders” in science teaching. They agree that “multiperspective” (Ogawa, 1999) or “collateral learning” (Jegede, 1995) is necessary in the acquisition of the culture of modern science as an indigenous student moves from his or her everyday world to that of the science classroom. They define collateral learning as the ability to hold in long-term memory the unresolved conflict of two explanations of everyday phenomena. They suggest that this conflict might be moved towards resolution, with the learning made more “secure” for the student, by the following means:
- Science curriculum being contextualised within the students’ daily lives;
- Culturally sensitive instructional strategy;
- Native language science teaching;
- Contribution of non-Western scientists being acknowledged; and,
- Bridges being built between the indigenous world view and that of modern science with the use of indigenous science knowledge and the comparison of the relative epistemologies of the indigenous culture and modern science.

They feel that it is important to make border crossings explicit rather than implicit, with the science teacher taking on the role of the “cultural broker”.

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Applying Kline’s analysis of complex systems

Kline’s hypothesis, (Kline, 1995) is that at least three views are needed for a reasonably good understanding of hierarchically structured systems with interfaces of mutual constraint: synoptic, piecewise and structural.

Structural View

Arguably, the most common type of architecture view is the structural view in which a system is depicted as a set of inter-related elements. Examples include blue-prints used by the architects of buildings and engineers in general as well as organisation charts used to depict the authority/responsibility structures in institutions.

A structural view of a typical university would therefore include its academic and administrative organisation charts and show the way all the elements within the academic system fitted together.

Piecewise View

Another common view is the piecewise view that depicts the smallest relevant parts of a system for a particular problem. Examples include detailed wiring diagrams produced by electronic and electrical engineers to depict components as well as musical scores used by composers to depict the notes to be played by the instruments in orchestras. A piecewise view of a University would therefore include all the individual people involved in its everyday life.

Synoptic View

A less common type of architecture view is the synoptic view. Synoptic views treat systems as atomic entities or wholes. They selectively emphasise characteristics of the system that are deemed to be salient in a given context and suppress information that is not pertinent in these respects. Examples include the synoptic weather charts used in television and newspaper weather reports, and topographical, political, climatic, demographic etc. maps.

Integrating the three views

This is best illustrated by returning to the scenario introduced previously. Let us assume a Computer Science Department of an Australian University is cooperating with an equivalent department of a large Chinese University in developing a joint online Masters program, to be taught online in China.

When we use Kline’s analysis we can readily obtain a structural view of both the Australian and Chinese departments. We can also develop a piecewise view of all the players, the academic staff, administrative staff and students who will be working and studying together, to conceptualise, design, develop, administer and study the course material. World view theory gives an opportunity to begin to identify where cultural factors begin to come into play and thus enable the development of a cultural synopsis of the system by the use of the general categories identified by Kearney.

When we consider the first item, factors which need to be taken into considerations are:

- **Attitude to authority**: does one culture behave in a more authoritarian way to the other?
- **Attitude to age and youth**: does one culture value the contribution of older people with more respect than the other?
- **Value of loyalty and previous working relationship**: does one culture place higher regard on personal loyalty to the other?
- **Formality in relationship**: will one culture value a more formal relationship than the other?
- **Gender differences**: Is there a difference in the role women play?

We can examine Classification and ask:

*How do these societies and who within these societies use computers*: are they the same uses? Do they have the same mathematical systems? Do the two native languages express mathematical concepts in the same way?
We can look then at Causality and ask:

*Does each culture understand causality in the same way:* are there strong religious or philosophical beliefs that will cause a different attribution of causality? Is superstition an issue?

*Does each culture espouse a western scientific explanation for natural phenomena?*

**Conclusion**

The development of these three views of any given human activity system provides valuable advice to an enterprise seeking to examine its own cultural makeup and the potential impact of this on growth or expansion, particularly in the area of global online learning environments. When considering the possibilities of merging institutional cultures or international expansion (and thus forming a system of systems), it is important to recognise that each institution or will bring a different group world view (whether a western scientific one or a non-western one), and individual perspectives which will produce a lack of uniformity within the system. This preliminary analysis shows that universities could be guided in their internal, external and global expansion and development of learning environments by the application of Kline’s type of analysis, supported by insights drawn from anthropology as encapsulated in world view theory.

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