Complexity Theory and Online Learning

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Abstract: An emerging group of young people, termed the global 'net generation,' is adopting remarkably similar learning approaches, which are characterized as integrated and multi-faceted, constructivist and chaotic. In contrast to the formal school setting where learning is linear, structured and controlled (be it online or face-to-face), for the 'net generation,' learning is often incidental and a sense of 'fun' is of paramount importance. Students' learning is often non-linear, unstructured and explained well by the tenets of complexity theory. This paper discusses the benefits of fostering non-linearity and complexity in an online learning environment. Central elements of complexity theory are briefly outlined and their relevance to online teaching/learning is highlighted. A case study of an online business communication course at a university in Hong Kong is used to illustrate the importance of non-linear and complexity-based online learning by demonstrating how participants in this course adopted learning approaches that are consistent with, and a reflection of, complexity theory.
Keywords: complexity theory; online learning; education; Hong Kong

Introduction

'There is nothing so practical like a good theory.' (Lewin in Biggs, 1999: xii)

The concept of online learning is a relatively new phenomenon and in the last decade research into this area has increased dramatically. A current Google search with the phrase 'online learning' produced 165 million hits (or links), which have some combination of the words 'online' and 'learning.' In regard to this massive information available on the Internet, a word of caution is in order: not all of the links are either relevant or useful. It is up to the researcher to establish which links are worthwhile pursuing. In addition to these websites, which may or may not be of use, there are hundreds of scholarly research sites, online academic journals, and popular literature. Educational organizations, as well, have created a very significant online presence by dispensing a wide range of courses and programmes. Athabasca University in Canada, Open University in the UK and Hong Kong and the University of Phoenix in the United States are but a few examples of these institutions.

The origins of the web and its importance to online learning

Online learning, and for that matter the World Wide Web (including the Internet), would've never become ubiquitous had it not been for the genius of Tim Berners-Lee. Tim Berners-Lee (2000) stated that he was brought up with the belief that, there have always been things that people were good at, and things computers have been good at and little overlap between the two. Implicit here is the central idea of the potential of people and computers to work together/communicate through the Web. The genius of Berners-Lee lies in the fact that he was able to combine the concepts of HyperText Markup Language – HTML (the code in which Web sites are written), HyperText Transfer Protocol – HTTP (the code by which sites are moved into and out of the Web), and UDIs (the ubiquitous URL – Universal Resource Locator – now commonly referred to as the Web address that appears in the browser's address window). By doing this, Berners-Lee made it fairly easy for anyone with Internet access to contribute, as well

as collect, send and receive information. This was the watershed in the development of the World Wide Web (See Fig. 1.1 below) and his invention opened up the way for people to communicate via computers across the globe. As a result, the World Wide Web that he created has an immense impact on how people communicate, learn and share information, both locally and globally. These communication networks, defined by Monge and Contractor (2003) as, 'patterns of contact that are created by the flow of messages (i.e. data, information, knowledge, images, symbols, and any other symbolic form) among communicators through time and space gave rise to a spectacular flow of information without regard for traditional national, institutional, or organizational boundaries '(p.3).
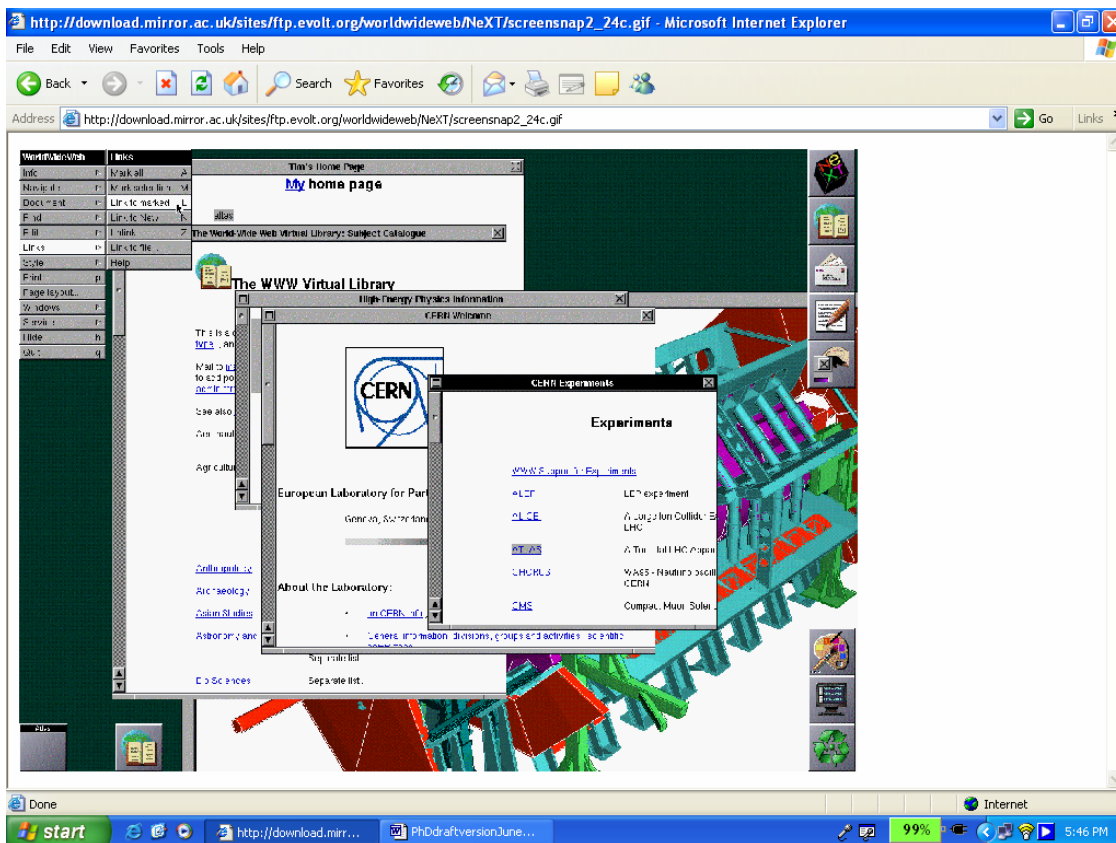

Figure 1.1: *Screen shots of Berners-Lee's original webpage developed at CERN.*
http://browsers.evolt.org/download.php?/worldwideweb/NeXT/screensnap2_24c.gif

With the advent of the World Wide Web, many current digital information communications technologies (ICTs) – including the Internet – have become integral tools in the pedagogical process. Four main features of these technologies (of which the concept of *interactivity* is central and will be expanded on further in this paper) are: integration of multimedia, flexibility of use, connectivity, and *interactivity* (Buckley *et al.*, 1999; Geer, 2000; Mabrito, 2000, 2001; Gillian *et al.*, 2001; Graham *et al.*, 2001).

Online interactivity via the CU Forum

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Drawing from more than eight years experience in using Web-based courses at The Chinese University of Hong Kong (CUHK), the author argues that Chinese-speaking students' interactions in the Messages section of the CUForum (a course management platform, similar to WebCT, and developed by the Information Technology Services Centre – ITSC – at CUHK) could best be described as non-linear, unstructured and explained well by the tenets of complexity theory. This paper discusses the benefits of fostering non-linearity and complexity in an online learning environment. To illustrate the complexity of an online learning environment, a one-semester online business communication course for 3rd. year students studying in the Faculty of Business Administration in a tertiary-level institution in Hong Kong is used here as the database for this study.

This paper focuses on the concept of *interactivity* from a complexity theory perspective. As Stewart (1991) quoted in Morrison (n.d. = no date) notes, 'the *interaction* (author's italics) of individuals feeds into the wider environment which, in turn influences the individual units of the network; they co-evolve, shaping each other' (p. 6). In addition, the concept of *interactivity* is also the key to communication. At its most basic, it is argued that if there is no interaction in an online environment between the participants (student/student, teacher/student, student/outside expert), then the CUForum (the online platform under study) remains an empty shell and, as a result, no communication takes place. 'A complexity-informed pedagogy *requires* communication' (p. 24) Morrison (n.d.) stresses.

A brief introduction to the learning styles of Chinese students

The learning styles of Chinese students appear to be qualitatively different from their Western counterparts. What follows is a brief outline of some of the main differences in learning styles and offers a glimpse into the way Chinese-speaking students, coming from a Confucian-heritage culture (CHC), can best be understood.

A number of prominent researchers in the field (Bond, 1991; Cortazzi and Jin, 1996; Flowerdew, 1998; Ho, 1996; Nelson, 1995; Watkins and Biggs, 1996) have noted that learners from a CHC background often subscribe to certain principles embedded in Confucian traditions. In Confucian philosophy, faithfulness (i.e. filial piety and social relationships, including the acceptance of the distance between teacher and student), and propriety (i.e. the concept of 'face' and 'self-effacement') are key Confucian values. These values have an enormous influence on the learning styles of Chinese learners. For example, when the teacher asks a question in a class of Chinese students, there is complete silence. No student will volunteer an answer. Confucian norms influence and even prevent students from speaking up in class. As a Chinese colleague pointed out when this Western researcher from Canada first arrived in Hong Kong in 1998

The teacher functions as the 'sage on the stage' and transmits knowledge directly to the students. Generally, the students are passive recipients of this knowledge and their role is to absorb it and then regurgitate all that they have learned during the final exam *(Personal correspondence, 1998).*

Contrary to the above colleague's assertion that Chinese learners are passive recipients of knowledge, Flowerdew (1998) argues that the use of group work for Chinese students fits very well into their Confucian worldview. As noted by Nelson (1995), 'Students learn through co-

operation, by working for the common good, by supporting each other and by not elevating themselves above others' (p. 9). Similarly, Cortazzi and Jin (1996) report that 'in Chinese society – and in the classroom – the priorities are that each person must be part of a group or community; learning interdependency, co-operation and social awareness are the accepted standards' (p. 178). To cite an example, the author noticed that when students are involved in group projects (either online on the CUForum or face-to-face in class), there is a strong sense of group harmony, with a corresponding feeling of sensitivity towards other members of the group. All the students work for the common good of the group. Flowerdew (1998) concludes that teachers may need to adjust their teaching styles in order to accommodate group work as a methodological tool on two accounts

> …either because it exploits the Confucian value of co-operation, which would seem to foster a style conducive to learning; or because it can be used to counterbalance the Confucian concepts of 'face' and 'self-effacement,' which could be considered as aspects which impair the learning process (p. 327).

In addition to group learning and co-operation in learning environments, there is also the issue of the strategies that Chinese students use to learn. Gow *et al.* (1996) challenge the stereotypical view of the Chinese student relying to a great extent on "rote learning and having a non-critical and non-analytical approach to the information learnt" (p. 109). They argue that the Chinese learning style is conditioned more by the learning environment and suggest that Chinese students adapt their learning styles to the context**,** i.e. students tend to adopt a superficial approach to learning when the situation requires it (for instance when preparing for an exam) and use a deep approach (when a wider understanding is required) if that is what is asked of them by their teachers. Rote learning can thus be understood in the context of the Chinese students' socialization processes and their motivation to achieve academic excellence.

In addition to the above, it is important to focus on the current research that deals with the various approaches to learning, namely the *surface, deep and achieving approaches* to learning.

There are two ways of interpreting 'approaches to learning'. Marton and Saljo (1976), in their identification of surface and deep approaches in case studies of tertiary-level students, state that one interpretation of 'approaches to learning' entails the process adopted prior to the outcome of learning. Another view is that of Biggs (1987, 1996a) who shows that it can refer to the pre-disposition to adopt particular processes, i.e. students are asked to fill out a questionnaire about how they go about learning (see the Study Process Questionnaire – SPQ – developed by Biggs) and based on the results of the questionnaire, the students' approaches to surface, deep and achieving are examined.

According to Biggs (1987, 1996a), the three approaches to learning are: surface, deep and achieving. The first is the surface approach to learning and it is based on extrinsic motivation, in that the students focus on what appear to be the most important topics (in order to satisfy the exam requirements) and use rote learning to reproduce them. There is little thought given to the interconnection between concepts, or the meanings and implications of what is learned. The students focus on the concrete and literal aspects of the task, for example the actual words that are used, without considering the wider meaning of the words.

The second approach is the deep approach to learning and it is based on intrinsic motivation or curiosity. In this approach the students seek meaning and aim to maximize understanding. There is a personal commitment to learning, which means that the students discuss the subject matter with others, focus on underlying meaning or meanings rather than on the literal aspects of the subject, theorize about the subject and relate what they have learned to previous knowledge. Deep processing challenges students' curiosity and engages them actively in the learning task. Implicit in the deep approach to learning is its social constructivist nature where learning takes place in a social sphere. This mirrors the Vygotskian perspective that higher order thinking means the capacity to go beyond the information given, to adopt a critical stance, to evaluate, to have metacognitive awareness and problem solving capacities. Having the capacity to be an autonomous thinker and make reasoned judgements is the quality that most often emerges in the literature discussing higher order thinking (Lipman, 1991; Paul, 1994).

Finally, the third approach, as Gow *et al*. (1996) demonstrate, and known as the achieving approach to learning, is based

> on a particular form of extrinsic motive: the ego-enhancement that   comes out of visibly achieving indicated particularly through receipt of high grades for the work (p.110).

The general strategy in the achieving approach is to maximize the chances of gaining high grades or winning prizes. While this approach may lead to optimal engagement in the learning task (similar to the deep approach), such engagement is the means, not the end (unlike the deep approach); the nature and extent of the engagement depend on what earns the most rewards (i.e. grades, prizes, honours, etc.).

The Western researchers who are parachuted into a situation where they see the stereotypical Chinese students 'rote-learning' their way through various tasks, may not see the 'big picture.' As Biggs and Telfer (1987), Gow *et al*. (1996), Kember and Gow (1990) point out, students' development of a certain learning approach depends on the teaching context. As Gow *et al*. (1996) phrase it

> The approach adopted by students depends on both the sociocultural setting as well as the school milieu. Students' approaches reflect not only their own attitudes, habits, abilities, and personality, but also the demands made by the learning environment (p. 111).

Thus, students may use a surface approach to learning when there is a great amount of material to be learned and this material will be tested on an examination. This type of approach is associated with time pressures, examination stress, and the use of test items that emphasize low-level cognitive outcomes. On the other hand, students are likely to develop a deep approach if they are encouraged to interact with other students, do task-based learning, and if the assessment requires them to understand the principles rather than reproduce facts and figures. Teachers at the tertiary level can modify their teaching situation by taking into account the learning approaches of students. For example, the teacher can help students to change the learning approach by changing the assessment method. This may change the students' motivation, which affects the outcome, which affects the teacher's perception of the students' performance and of

course the students' self-perception. Thus, it is important to consider the particular learning style of Chinese-speaking students because this has an impact on how these students interact both face-to-face and in an online environment on the CUForum.

English/Cantonese as a medium of instruction

It is noteworthy to clarify at this point that in Hong Kong English is characterized as a second language (L2): the *lingua franca* of commerce, industry, technology, medicine and education. Although Hong Kong students start learning English as a second language from Primary 1 and all the way through Secondary 7 (a total of 13 years of schooling in English as 2nd. language), their command of the language is problematic. As Gow *et al.* (1996) report, 'the majority of students do not have sufficient competence in English to learn the subjects' content through this second language' (p.117). This problem is compounded when the students enter university. Pennington *et al.* (1992) demonstrated that tertiary level students used English predominantly within the context of education. The above situation, as elaborated by Gow *et al.* (1996) and Pennington *et al.* (1992), is clearly reflected at this author's university. In many departments, university teachers use a combination of English and Cantonese in their lectures and they encourage their students to read the course textbooks, articles, scientific journals and technical reports in English. Cantonese is the predominant language used in lectures (combined with a large number of English terms that have no equivalents in Chinese). Thus students can attend lectures in their mother tongue (Cantonese), but need to use English to supplement their learning. This creates the situation where students listen to lectures in Cantonese, discuss the lecture material in Cantonese, then read texts in English and write term papers in English.

Notwithstanding the nature of the language of instruction (Cantonese/English) in most major faculties at this author's university, at the English Language Teaching Unit (ELTU) of the Chinese University of Hong Kong (CUHK), students enroll in English language-related courses such as business/technical communication, oral fluency, grammar for university studies, listening and speaking, and others. English is used as the medium of instruction to deliver specific content (e.g. English for Architectural Studies, Business Communication, Technical Communication, etc.). The policy at the university is that all undergraduate students have to take a minimum of 2 one-semester courses at the ELTU in order to satisfy the requirements for a degree.

Complexity theory

How is complexity theory defined? Morrison (n.d.) put it most eloquently when he wrote that 'complexity theory, which suggests alternative ways of conceiving the world and, thereby, of researching it, is a theory of change, evolution, adaptation and development for survival' (p. 3). Or, to state it in other words, Conner (2004) defines complexity theory as

> A scientific theory that asserts that some systems display behavioral phenomena that is completely inexplicable by any conventional analysis of the systems' constituent parts (p.1).

The term *complexity,* according to Mikulecky (2005), is defined as

> the property of a real world system that is manifest in the inability of any one formalism being adequate to capture all its properties. It requires that we find distinctly different

ways of interacting with systems. Distinctly different in the sense that when we make successful models, the formal systems needed to describe each distinct aspect are NOT derivable from each other (p.3).

Further, Gell-Mann (1995), in writing about the definition of complexity, gives the following examples of this term

Examples on Earth of the operation of *complex adaptive systems*   [author's   italics] include biological evolution, learning and thinking in animals (including people), the functioning of the immune system in mammals and other vertebrates, the operation of the human scientific enterprise, and the behavior of computers that are built or programmed to evolve strategies by means of neural nets or genetic algorithms. Clearly, complex adaptive systems have a tendency to give rise to other complex adaptive systems (p. 3).

Although the literature surrounding complexity theory is relatively recent, it is nevertheless comprehensive and is authored by high profile scientists from many fields (see http://agelesslearner.com/intros/complexity.html). At its most basic, complexity theory tries to explain the, 'big consequences of little things' (Phelps, 2003 p. 3). Complexity theory recognizes that the world around us is irreducibly complex and it is not something that is determined, predictable or completely controllable. As Gare (2000) points out, the challenge for researchers is therefore not to just identify the simple elements that underlie reality, but to go beyond that and study complexity in its own right. As Morrison (2002) states, 'complexity theory looks at the world in ways which break with simple cause-and-effect models, linear predictability and a dissection approach to understanding phenomena (p. 8).

Some key features of complexity theory are

1. Self-organization
'The essence of self-organization is that system structure often appears without explicit pressure or involvement from outside the system. In other words, the constraints on form (i.e. organization) of interest to us are internal to the system, resulting from the interactions among the components and usually independent of the physical nature of those components. The organization can evolve in either time or space, maintain a stable form or show transient phenomena. General resource flows within self-organized systems are expected (dissipation), although not critical to the concept itself' [Online] Lucas (n.d.).

Morrison (n.d.) posits that 'a central pillar of complexity theory is self-organization; it contains several features*: adaptability, open systems, learning, feedback, communication* and *emergence.*' (p. 5)

2. Complex adaptive systems/complex responsive processes
Complexity theory 'maintains that the universe is full of systems and that these systems are complex and constantly adapting to their environment' [Online] Fryer (n.d.). Hence there is the complex adaptive system. On the other hand, complex responsive processes depend on repeated interactions between individuals and lead to emergent patterns of behaviour which

can best be understood from a complexity perspective without requiring the entire system to meet all the features of a complex adaptive system (Also see Burton [Online], 2002).

3. Distributed control
'Control is distributed throughout the system; local decisions are made by parts or modules within overall constraints' [Online] Lucas (2004).

4. Dynamical systems
A dynamical system 'constantly changes the environment and is changed by the environment' [Online] Begley (1999).

5. Holism
Holism is 'the idea that all the properties of a given system … cannot be determined or explained by the sum of its component parts alone. Instead, the system as a whole determines in an important way how the parts behave' [Online] Wikipedia (n.d.).

6. Open systems
An open system 'interacts with the environment trading energy & raw materials for goods & services produced by the system. They are self-regulating and capable of growth, development & adaptation' [Online] Begley (1999).

7. Feedback and recursion
Feedback is the 'Information about some aspect of data or energy processing that can be used to evaluate & monitor the system & to guide it to more effective performance' [Online] Begley (1999). 'Through feedback, recursion, perturbance, auto-catalysis, connectedness and self-organization, higher levels of complexity and differentiated, new forms of life, behaviour and systems arise from lower levels of complexity and existing forms' Morrison, [n.d.] (p. 6). '*Feedback* must occur between the interacting elements of the system' Morrison, [n.d.] (p. 7).

8. Relationships
'The ways in which the agents in a system connect and relate to one another is critical to the survival of the system, because it is from these connections that the patterns are formed and the feedback disseminated. The relationships between the agents are generally more important than the agents themselves' [Online] Fryer (2006).

9. Self-organized criticality
Self-organized criticality is the 'ability of a system to evolve in such a way as to approach a critical point and then maintain itself at that point' [Online] Lucas (n.d.).

10. Networks
Complexity science is the study of interactive dynamics involving neural-like networks of agents [Online] Marion (n.d.).

11. Diversity

'The key to complexity is internal diversity, which implies heterarchy: heterogeneity driving up-down processes that drive side-side interactions spawning further heterogeneity' [Online] White (2001).

12. Nonlinear systems
'Nonlinear systems demonstrate bifurcations: rapid, unpredictable, often catastrophic transitions to new states that occur at critical points or thresholds. One state that can arise at a bifurcation is chaos, wildly unpredictable network behavior common to nonlinear systems' [Online] Ezine (2003).

13. Emergence
Emergence is the 'order that emerges from the interaction of all the component parts of the system (e.g. an emergent property of the brain is consciousness; an emergent property of an embryo and the cells it contains is a mature individual, etc.)' [Online] Young (2003).

14. Connectivity/Connectedness
'Connectedness, a key feature of complexity theory, exists everywhere' Morrison, [n.d.] (p. 7). Connectedness refers to 'the idea of representing a group of interacting agents as a network of 'nodes' linked by connections. The concept shows how the capacity for learning evolution can emerge even if the nodes, the agents, are brainless and dead' [Online] Moobela (n.d.). 'Complexity Theory emphasizes *connectivity*, the quality of relationships and connections between the agents in the system' [Online] Tosey, (n.d.). In fact, connectivity is 'the relation of an agent to its neighbours, it can be sparsely connected (only affected by a few neighbours), fully connected (interfacing with every other agent in the system) or some intermediate arrangement. This parameter critically affects the dynamics of the system' [Online] Lucas (2006).

A number of researchers (Bloom, 2001; Phelps, 2003; Doll, 1989a) have noted that complexity theory is a useful theoretical lens that could be used to analyse online learning environments. Most notably, complexity theory provides a new perspective and a new understanding of Web-based learning: learning that is characterized as non-linear, student-centered, emergent, and connected. As Bloom (2001) says, 'Although we may be able to predict that certain types of events or ideas may rise, we cannot predict the specific content or outcome' (p.23).

Complexity theory thus, according to Phelps (2003)challenges current educational practices, which see teaching as a   simplistic cause-effect system and where provision or 'delivery' of content and a structure for students to engage with this content is   perceived as a central part of teaching (p.3).

Phelps (2003) also argues that, 'with complexity's recognition, it is impossible to break down learning and teaching into determinist and predictable simple elements of knowledge' (p. 4). As Doll (1989a) notes Curriculum becomes a process of development rather than a body of knowledge   to be covered or learned, ends become beacons guiding   this process, and the course itself transforms the indeterminate   into   the determinate (Doll, 1989a, p. 250 quoted in Phelps 2003, p.3).

The above is just a brief outline of complexity theory and its relevance to online learning. The literature explaining it in full detail is available from many sources (e.g. Waldrop 1992; Arthur, 1994; Axelrod, 2001; Kauffman, 1996, 2000; Holland, 1999; Morrison, 2002 ;).

For the purposes of this paper, complexity theory (namely, the features outlined previously) is used to answer the questions posed in the beginning of this paper, namely,

1. What are the benefits of fostering non-linearity and complexity in an online learning environment (i.e. the CUForum)?

2. Which features of complexity theory are applicable, and relevant, to online teaching/learning?

The CU Forum

The following short, end-of-term quotation from one of the students who took a business communication course in 2004 reflects a very popular and common sentiment amongst all of the students who have used the CUForum. She said

> The first time I attended this course, I had a feeling that this course would be quite interesting. This is because I can see many *interactions* [author's italics] between the teacher and the students. Also, there is a class where we need to go to the computer lab to have a lesson. I think this is very good since we can use the computer to do various things, such as checking messages posted by the teacher and students, posting our work, uploading photos, checking out the links, etc. This kind of teaching method should be kept, as it is very effective.

(Posted on the CUForum in 2004 – Personal correspondence from a 3rd. year undergraduate student in Business Administration at CUHK)

This study uses data from the CUForum (http://cuforum.cuhk.edu.hk), a course management platform, developed by the Information Technology and Services Centre (ITSC) at The Chinese University of Hong Kong (CUHK) and launched in late August 2000. Its origins were based on an extensive survey of teachers' needs and the aim was to create a conferencing tool that could be used by the university community. Subsequently, the CUForum has evolved into what is now a full-featured online course delivery platform, rivaling, and perhaps surpassing, elearning tools such as WeBCT, BlackBoard and others. It is evident that teachers are no longer using the CUForum for posting lecture notes. Instead, they are now experienced in integrating this platform into their courses by using advanced functions such as, password protection, contents publication, discussion forums, assignment submissions, student accounting and assessment, course calendar, private email, photos, Web links, and course progress tracking. The CUForum supports community sharing between teachers, students and learning resources. It has become an important tool for teachers to conduct teaching activities and an indispensable medium for their classes to communicate and collaborate (http://www.cuhk.edu.hk/wbt).

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It is important to note at this point that a full discussion (and demonstration) of the CUForum is beyond the scope of this paper, so the focus is limited to the Messages section. The Messages section is one of the most frequently used sections of the CUForum. In this section, users can post new topics for discussion, read messages posted by others (teacher and students), reply to topics, post files and photos, etc. As can be seen from the screen shot (see Fig. 1.2), this section is organized around threads (in a linear and descending order, i.e. the first message contains a date and time stamp and all the messages that follow are organized in chronological order). The students can see at a glance how many students are active in any one particular thread, at any particular point in time and they can respond by looking at the message subject and the name of the writer. The Messages section is the first page that opens up once the students login (it is the default page) and students can choose to view all or only the new messages by clicking on the 'View all' or 'New Only' buttons. This function is not limited to the Messages section, but is also applicable to all the sections on the CU Forum (i.e. Files, Photos, Links, etc.).
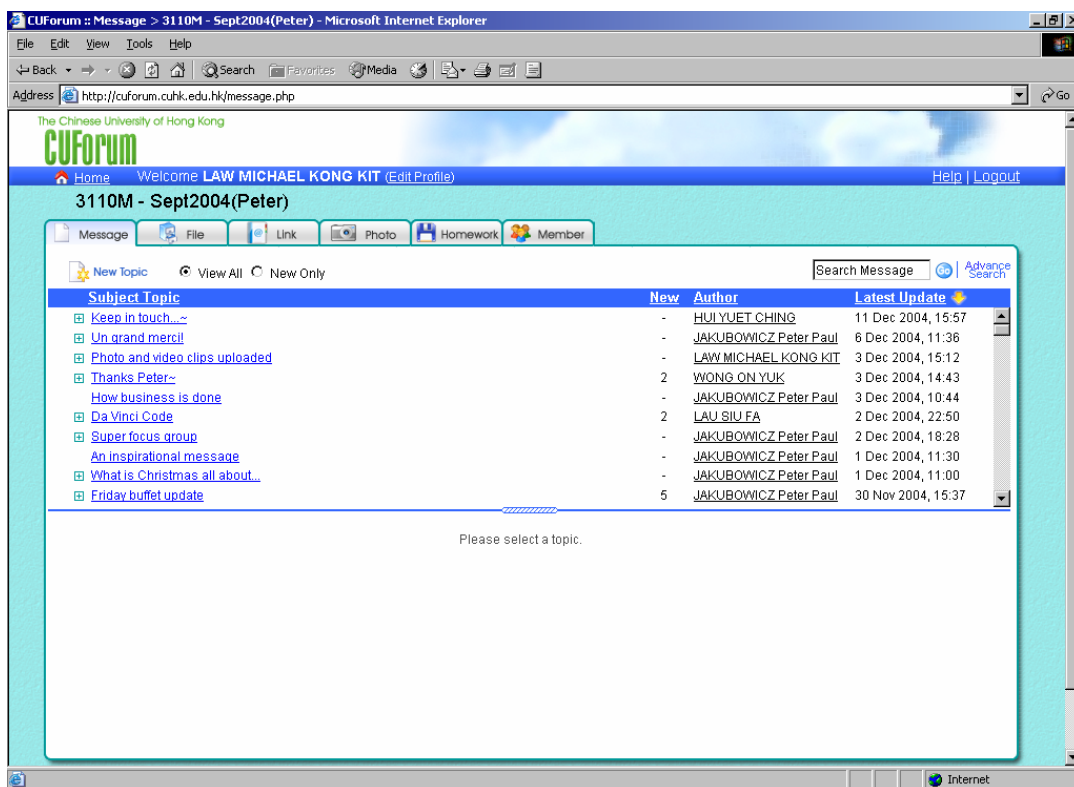

Fig. 1.2: *Screen shot of the Messages page of the CUForum*

From this very brief introduction to the CUForum, it is appropriate at this stage to provide an answer to the two aforementioned questions posed earlier in this paper, i.e. 1) What are the benefits of fostering non-linearity and complexity in an online learning environment (the CUForum)? and, 2) Which features of complexity theory are applicable, and relevant, to online teaching/learning?

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Questions 1 & 2 are interconnected in such a way that in order to analyse the CUForum one can't very well separate the concepts of 'non-linearity' and 'complexity' from the features of complexity theory. Both 'complexity' and 'non-linearity' are features of complexity theory (as was stated previously) and to do justice to the questions, a holistic approach should be considered. What this means is that the best way to look at the relevance of some of the features of complexity theory is to find evidence of these features in the Messages section of the CUForum (i.e. to analyse the messages that were written during the 13-week semester in one particular business communication course).

What are some of the features of complexity theory that are evident in the Messages section? In the very first message written by the instructor, which is a welcome message, the students are given the opportunity to introduce themselves and write a brief text that outlines their thoughts, opinions, and feelings about the course.

Topic: A Warm Welcome
Author: JAKUBOWICZ Peter Paul
Date: 5 Sep, 2004, 19:54
Message:
Dear Class,

I'd like to welcome you all to an exciting new business communications course (fall 2004 Edition).

This forum is the place where you can post all kinds of new messages, upload files, including JPG (photo files, etc), and generally use this forum to do peer-evaluation, write messages to each other, etc.

Hope you'll find this course productive, make new friends, and learn something valuable in the process.

Cheers!

Peter

Fig. 1.3: *The instructor's welcome message*

Topic: Re: A Warm Welcome
Author: XU XIAOCHEN
Date: 6 Sep, 2004, 13:56
Message:
Dear all,

My name's Catherine. I live in Hostel Two, Shaw College. I saw some familiar faces (Ying, Janet, Tony and Qinghua) in this class. So I am happy. And it seems that Peter is a nice guy. I am not regreted that I chose section L of ELT3110:))

For my expectation of this class, I hope my CV and resume can be improved. Also, learn more and more interview skills. I see this course as a bridge that link us to a satisfied and good job next year.

Good luck to all of us. Hope to know all of you as well.

Catherine

Fig. 1.4: *Student A's reply to the instructor's welcome message*

No.: 3
Topic: Re: A Warm Welcome
Author: WAN WING
Date: 6 Sep, 2004, 13:57
Message:

Dear All,

Nice to meet you all in the class. My name is Wan Wing, you can call me Echo. I am a year 3 PAC student, United College. My hobbies are travelling, taking photo, reading, shopping and sports. And I have come back from Tibet just now.

I hope I can improve my English and make some good friends in this course. We will start to find job in this sem, so I would like to improve my interview skills also.

Cheers,

Echo ^_^

Fig. 1.5: Student B's reply to the instructor's welcome message.

The above 3 examples of messages are very clear evidence of *interactivity* and are but a tiny sample of the 1,222 messages (98,257 words in total and over 508 pages of transcript!) that were written during the business communication course in the fall semester (between Sept. - Dec. 2004). In general, the messages (both the replies to the messages and the new posts) do afford a glimpse into the content, nature, length, quality, language and tone of the writing. Furthermore, these messages (saved in their original in MS Word format and available on CD-Rom) provide a

rich sampling that could lend itself to a qualitative analysis using NVivo V1.3 (or any other qualitative analysis tool) and provide a rich database for future researchers who are interested in studying online learning.

How is the above sample of messages relevant to the aim of this paper, and more importantly, what features of complexity theory are reflected in the CUForum (discussed below)? From the original 22 students who were registered in, and completed this business communication course in the fall of 2004, the range of messages 'Read' were between a minimum of 14 messages and a maximum of 1216 messages. This means that, according to the 'Member Usage Report' (See Appendix 1 - archived on the CUForum course website) during the 13-week semester the 22 students collectively 'Read' a total of 14,738 messages and the average number of messages 'Read' was 670. These numbers lend credence to the idea that *interactivity* does play a major role in the CUForum. From this strictly quantitative perspective, the results of student *interactions* do not do justice to the rich variety of topics that the students covered. This analysis certainly does not give a true picture of the content, nature, length, quality, language and tone of the messages.

What Features of Complexity Theory are reflected in the CUForum?

From the above brief discussion of *interactivity* one can assume, and as complexity theory postulates, that *interactivity* is a central feature of this one example of online learning. *Interactivity* is clearly evident in the CUForum. *Firstly*, the CUForum could be considered a **complex adaptive system/ complex responsive system** where complex responsive processes depend on repeated *interactions* between individuals. *Secondly*, **feedback** occurs between the interacting elements on the CUForum, i.e. there is ample evidence that students not only write/post messages, but there is genuine feedback occurring within the messages between the participants. *Thirdly*, the **relationships** that the students develop during the semester is another example of one of the main features of complexity theory, and it is through these relationships that the students can maintain the momentum and keep the CUForum active (i.e. 'The ways in which the agents in a system connect and relate to one another is critical to the survival of the system, because it is from these connections that the patterns are formed and the feedback disseminated.') [Online] Fryer (2006). *Fourthly*, the CUForum is a **network**; a network in which interactive dynamics involve neural-like networks of agents. *Fifthly*, **diversity** is clearly present on the CUForum. There is not only the difference between the messages written by male and female participants, but there is also the difference between participants who initiate messages and those who do not. As noted earlier, 'the key to complexity is internal diversity, which implies heterarchy: heterogeneity driving up-down processes that drive side-side interactions spawning further heterogeneity' [Online] White (2001). *Sixthly*, there is the concept of **emergence**. This is defined as the 'order that emerges from the interaction of all the component parts of the system' [Online] Young (2003). *Seventhly*, **connectedness** 'a key feature of complexity theory, exists everywhere' Morrison, [n.d.] (p. 7). Connectedness refers to 'the idea of representing a group of interacting agents as a network of 'nodes' linked by connections. [Online] Moobela (n.d.). Thus, it could be seen from the above that there is strong evidence from the CUForum data that the seven features of complexity theory mentioned herein are not only relevant to the study of online learning, but provide a sound theoretical lens that could shed more light on what occurs in an online learning environment.

Conclusion

This paper argued that *interactivity* on the CUForum (the online learning platform in this study) is often non-linear, unstructured and explained well by the tenets of complexity theory. Central elements of complexity theory were briefly outlined and their relevance to online teaching/learning was highlighted. A case study of an online business communication course at a university in Hong Kong was used to illustrate the importance of non-linear and complexity-based online learning by demonstrating how participants in this course adopted learning approaches that are consistent with, and a reflection of, complexity theory.

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APPENDIX 1: SCREEN PRINT OF REPORT

Back

Member Usage Report
3110L – Sept. 2004

Delete All

User Name (NAMES HAVE BEEN REMOVED)	User ID		Msg		File		Link		Photo		Login Count	First Access	Last Access
			Read	Post	Read	Post	Read	Post	Read	Post			
s027717	387	23	0	0	0	0	0	0	73			6 Sep 2004, 13:41:23	30 Apr 2005, 01:26:42
s015120	1113	43	0	0	0	0	0	0	139			6 Sep 2004, 13:42:15	6 Jan 2005, 10:55:44
s026061	699	18	0	0	0	0	0	0	90			6 Sep 2004, 13:41:18	5 Jul 2005, 21:33:21
s027663	523	37	0	0	0	0	0	0	90			6 Sep 2004, 13:43:13	29 Jul 2005, 22:20:00
s035095	480	23	0	0	0	0	0	0	172			6 Sep 2004, 13:41:10	12 Jan 2005, 14:15:16
s025985	685	87	0	0	0	0	0	0	161			6 Sep 2004, 13:42:41	4 Jan 2005, 13:52:24
s026467	520	25	0	0	0	0	0	0	66			6 Sep 2004, 13:42:22	25 May 2005, 01:16:50
keith	0	0	0	0	0	0	0	0	0				
s026930	908	11	0	0	0	0	0	0	60			6 Sep 2004, 13:42:56	25 Feb 2005, 10:22:09
s037348	45	2	0	0	0	0	0	0	20			27 Oct 2004, 01:38:14	8 Jan 2005, 00:44:38
s017527	14	2	0	0	0	0	0	0	2			6 Sep 2004, 13:29:59	6 Sep 2004, 13:37:26
s025489	573	12	0	0	0	0	0	0	70			6 Sep 2004, 13:47:08	27 Mar 2005, 11:45:13
s017892	61	2	0	0	0	0	0	0	20			6 Sep 2004, 13:43:09	25 Apr 2005, 15:38:20
s025973	1216	95	0	0	0	0	0	0	161			6 Sep 2004, 13:39:58	22 Jul 2005, 08:54:19
s025356	202	34	0	0	0	0	0	0	75			6 Sep 2004, 13:41:22	25 May 2005, 11:17:31
s027578	846	53	0	0	0	0	0	0	75			6 Sep 2004, 13:40:34	10 Dec 2004, 00:42:58
s027979	380	13	0	0	0	0	0	0	43			8 Sep 2004, 23:50:42	3 Dec 2004, 16:26:04
s027993	711	23	0	0	0	0	0	0	71			6 Sep 2004, 13:41:37	7 May 2005, 15:42:17
s025550	1178	97	0	0	0	0	0	0	90			6 Sep 2004, 13:38:07	13 Dec 2004, 22:01:55
s027415	916	96	0	0	0	0	0	0	166			6 Sep 2004, 13:41:34	30 Jul 2005, 19:14:04
s015463	857	62	0	0	0	0	0	0	103			9 Sep 2004, 13:08:03	30 May 2005, 12:02:11
s025656	1208	170	0	0	0	0	0	0	86			6 Sep 2004, 13:44:03	18 Mar 2005, 15:27:26
s017890	1216	118	0	0	0	0	0	0	173			6 Sep 2004, 13:42:37	15 Jan 2005, 22:08:34
Admin	b101895	987	89	0	0	0	0	0	0	393		4 Oct 2004, 16:41:50	12 Jul 2006, 01:44:08