2010

# The Integration of Context Of Learning, Concepts Of Learning And Approaches To Study Data Communications

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# THE INTEGRATION OF CONTEXT OF LEARNING, CONCEPTS OF LEARNING AND APPROACHES TO STUDY DATA COMMUNICATIONS

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**Abstract:**

This paper explores the integration of context of learning, concepts of learning, and approaches to study data communications. Students' responses show that their approaches to study are directly related to the context and concepts of learning. Five concepts of learning are illustrated through three models proposed by previous studies. These concepts are then used as benchmarks for developing models of teaching to enhance the students' approaches to learning. It is found that students with intrinsic interest who are academically orientated automatically adopt the deep approach to learning whilst academically orientated students with extrinsic interest can adopt the deep approach only with help from institutional context. Accordingly, this paper proposes a practical teaching / learning model to help students to attain the deep approach to study. To date the model has changed students' orientation to study, as well as encouraged some students towards the deep approach to study.

**Keywords:** context of learning, concepts of learning, approaches to study, models of teaching

## I. INTRODUCTION

The integration of context of learning, concepts of learning, and approaches to study are explored through qualitative study involving students from the Master of Information Systems (MIS) program. It is expected that students' approaches to study are directly related to the context and concepts of learning. The learning context, as perceived by a student, forms an integral part of his or her experience of learning. This perception gives rise to various conceptions of learning which categorize the different approaches taken by the student to study [Elton and Laurillard, 1979; Marton et al, 1984]

There are two approaches to learning, namely surface and deep. Surface approach is the orientation towards memorization, perceiving learning as some kind of passive transmission of what is on paper into the head of the learner [Marton et al, 1984]. A deep approach to study primarily refers to the realization of the fact that the studies one is engaged in deal with some aspect of the "real world" and hence by studying, one can try to improve one's understanding of it [Marton et al, 1984]. A deep approach to learning can be cultivated through context of learning.

## II. CONTEXT OF LEARNING

Context of learning can be categorized as institutional and personal. Institutional context is the formal demands of the assessment system, students' perceptions of teaching, and course design. Personal context is about students' orientations, interest, aims and purposes in engaging a course of study. Their orientations may be academic, vocational, personal, or social [Marton et al, 1984]; these can be intrinsic and/or extrinsic. Intrinsic is learning out of interest and a desire to find answers to problems whereas extrinsic is learning out of the motive of fulfilling the demands raised by others, such as parents and/or lecturers. Those who are intrinsic would invariably adopt the deep approach. Furthermore, they would want to apply what they have understood to "real world" situations. Those who are academically extrinsic, however, are very much "syllabus bound". Thus, the approach that this group of students takes depends very much on the institutional context.

Marton et al. describe a "framework for understating the effects of the learning context" as consisting of "a number of separate but interconnected levels":

1. "the student's interest and experience",
2. "effects of assessments",
3. "effects of teaching and course design",
4. "the context of learning in different subject areas",
5. and "study orientation and perceptions of academic departments".

Level 1 can be illustrated by examples from two students [Biggs, 1998]; Susan and Robert. Susan is very motivated, academically intelligent, and very committed to tertiary study. She typifies the "HD (High Distinction)"/ "D (Distinction)" students. Robert, on the other hand, is unmotivated; he comes to university to get a qualification for a job, a pass degree would do. Prior knowledge of the subject can affect the student's approach to learning [Shaw and Golding, 2005]. But in first year tertiary study, with students like Robert, even if they had prior knowledge, they probably will not perform better than students like Susan, simply because the Roberts are not committed.

Level 2 of the framework (Marton et al, 1984) regards the effects of assessments on students' perception of learning. Much has been studied about the effects of assessments on student learning (Biggs , 2003). How profound the effects are can be gauged from the following statement (Ramsden, 2003): "the methods we use to assess students are one of the most critical of all influences on their learning." For example, the use of multiple choice exams to assess independent facts leads to students adopting the surface approach to learning (Ramsden, 2003), (Biggs, 2003).

Besides assessment, two other aspects of the context of learning also hold key role positions and they are: effects of teaching and course design. The most important qualities of a good lecturer are interest in their students and willingness to assist them with their study difficulties; these are the qualities that can influence students' attitude and approaches to learning [Marton et al 1984]. Commitment, enthusiasm, lecturing ability, and willingness to provide useful and timely feedback are other essential qualities that a lecturer should possess.

Good course design can be produced through the so-called "constructive alignment" which refers to the alignment of the objectives of the curriculum to the teaching and learning activities, as well as to the assessment tasks (Biggs , 1999).

With respect to level 5, four distinct educational student orientations were identified [Marton et al 1984], each exhibiting unique interest, aim, and concerns regarding learning (Table 1). Students with vocational orientation tend to work hard on the course. If they are also academically oriented, they tend to perform well.

Table I. Students' Orientation, Interest, Aim and Concerns

| Orientation | Interest | Aim | Concerns |
|---|---|---|---|
| Vocational | intrinsic | Training | relevance of course to future career |
| | extrinsic | Qualification | recognition of worth of qualification |
| Academic | intrinsic | follow intellectual interest | room to choose stimulating lectures |
| | extrinsic | educational progression | grades, academic progress |
| Personal | intrinsic | broadening or self improvement | challenge, interesting material |
| | extrinsic | compensation or proof of capability | passing course, feedback |
| Social | extrinsic | having a good time | facilities for sports and social activities |

Academically oriented students with intrinsic interest in the course would do well like the Susans, because of their intellectual interest in the course. Those students with the same orientation but who are extrinsic can also be like the Susans because they are challenge-oriented, competitive and high achievers.

Students with personal orientation can perform well if they are intrinsically interested in the course, especially if they want to prove that they can do well. Those students with social orientation tend to be extrinsic [Marton et al 1984]. They place high emphasis on the social life in university. These are the Roberts as in [Biggs , 2003].

Figure 1 illustrates how context of learning originates from institution and students' perception of this context gives rise to various concepts of learning. It will be discussed in the following section through studies conducted by Marton, Shaw and Hoffmann.

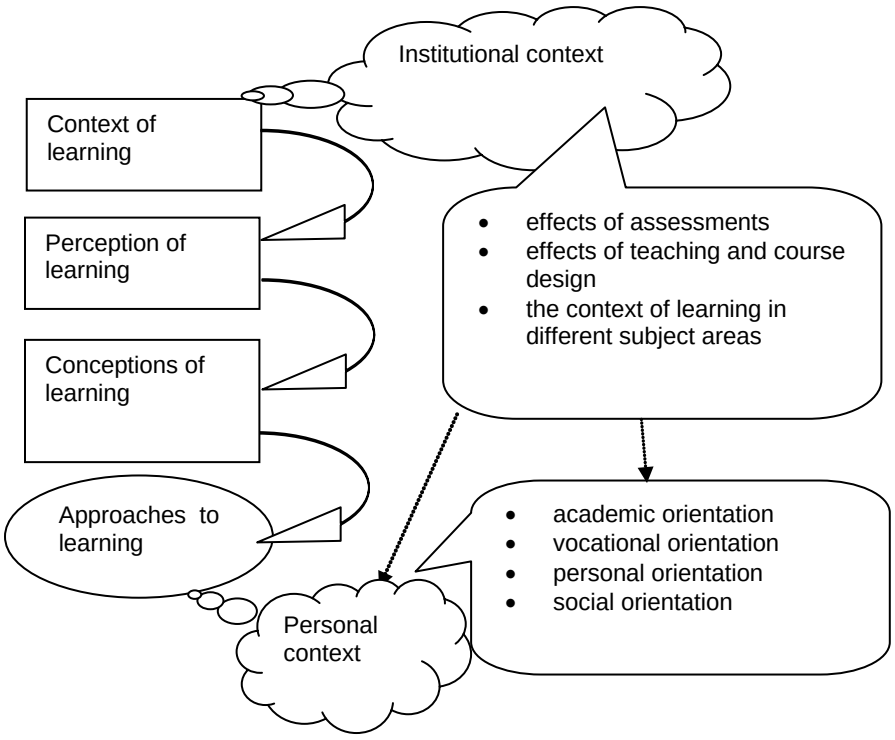


Figure 1. Relationship between Institutional Context, Personal Context, and Students' Approaches to Learning

## III. CONCEPTS OF LEARNING

A very recent study of the concepts of learning, the "multi-step-procedure" engineering model of learning [Hoffmann, 2005], is depicted in Figure 2 which consists of acquiring five types of knowledge: factual, conceptual, procedural, canonical (higher level of learning), and strategic (highest level of learning).

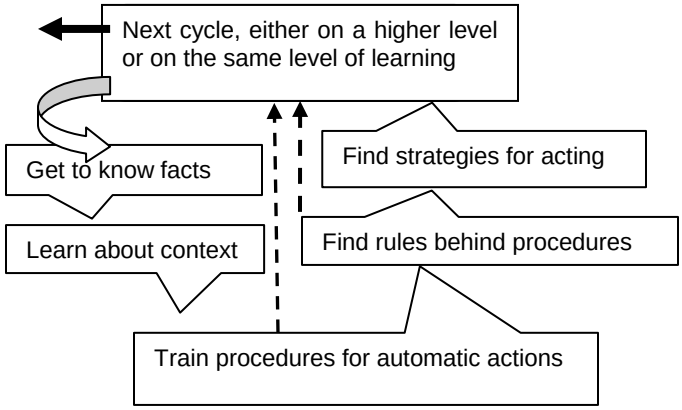


Figure 2. Hoffmann's Engineering Model of learning (adapted from [Hoffmann, 2005])

Five qualitative concepts of learning cited in (Marton et al 1984) are:

1. quantitative increase in knowledge,
2. memorizing,
3. acquisition of facts, methods, and so on which can be retained and used when necessary,
4. abstract of meaning, and
5. an interpretative process aimed at understanding reality

Mapping the model in Figure 2 to the above concepts of learning gives Figure 3. The first three are linked to the surface approach to learning and the concepts four to five give the deep approach to learning. Memorization is a tool with which the third concept can be achieved. Abstracting meaning from what we read, see and hear can improve our understanding of reality, hence reaching the deep approach to learning.

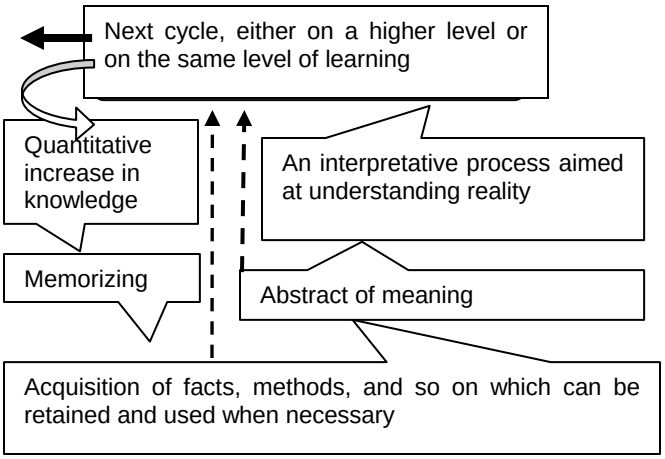


Figure 3. Saljo's Qualitative Concepts Of Learning

Biggs' SOLO (Structure of Observed Learning Outcome) also consists of five concepts of learning and is shown via Figure 4, derived from mapping Figure 2 to SOLO.

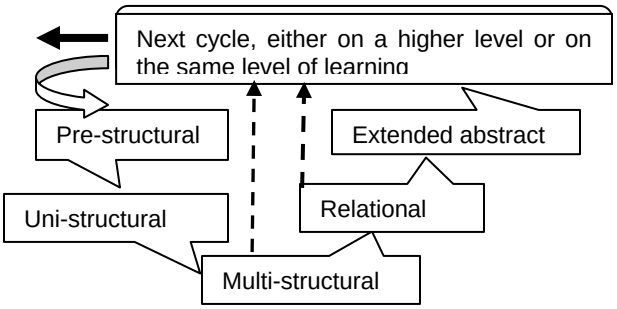


Figure 4. Structure Of Observed Learning Outcome

Based on these three models of concepts of learning, we developed a model of teaching aimed at improving student learning activities.

## IV. A MODEL FOR TEACHING APPLIED DATA COMMUNICATIONS

This section integrates the context and concepts of learning with approaches to study through a model for teaching Applied Data Communications.

This teaching model consists of five components as depicted by Figure 5. The lecture - passive transmission of knowledge to students - is the most common method for teaching information. It is deemed to be an ineffective means of teaching: “forty studies suggested that unsupervised reading is better than lecturing.” [Biggs, 2003]. Thus, to avoid mere passive transmission of information in lectures, we include a student participation component.

“A good teaching system aligns teaching method and assessment to the learning activities stated in the curriculum objectives, so that all aspects of this system are in accord with supporting appropriate student learning.” [Biggs, 2003] In order to align the objectives of each lecture session to assessment, our teaching model embeds a heavy component in the student learning activity in which the students have to do an in-class assignment which directly aligned to the lecture objectives of the week.

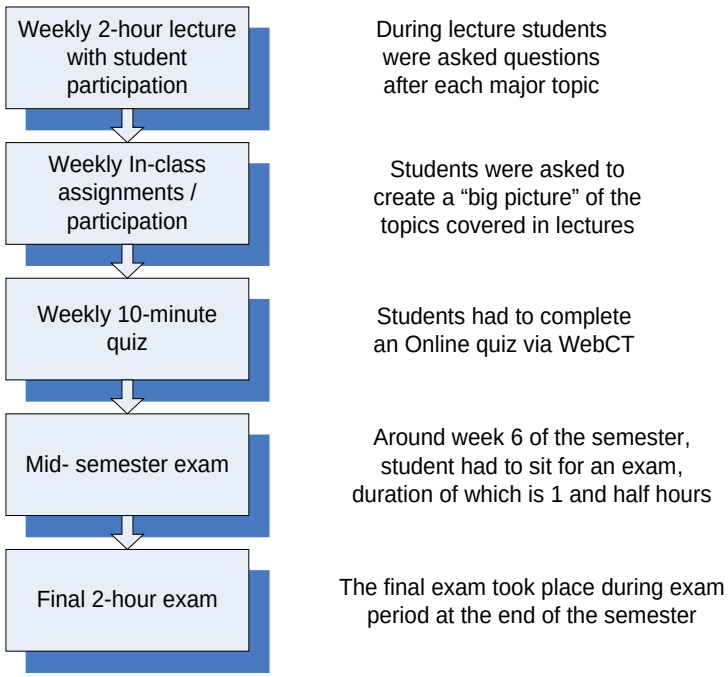


Figure 5. A Model of Teaching Applied Data Communications

Before attempting their in-class assignment of the week, students had to attempt a short online quiz via WebCT which was designed to ensure student active engagement (attendance) at tutorials as well as encouraging preparation for tutorials(learning each week’s topics). The first objective (attendance) is realized by this component of the teaching model but the second (learn each week’s topics) is useful only for the motivated students as multiple choice and true / false

assessment tasks are not effective in evaluating students' learning outcomes. The first three components of the teaching model are designed to make the students prepare for the mid-semester and the final exams. They are also instruments for facilitating continuous assessment, thus enabling to track students' progress, making early intervention possible when necessary.

## V. ANALYSIS OF THE TEACHING MODEL

Compared to previous years, this teaching model is effective in the following ways:

- the model encourages the students to attend lectures and tutorials, shown by regular attendance;
- improvement in student performance

Table 2 shows four different assessment systems employed by our four teaching models.

### MODEL_04 AND MODEL_05

This is the traditional assessment model ubiquitously used by most teachers in higher education, as well as in high school. The assignment is set normally to assess one topic. Furthermore, assessment through a big assignment on isolated topic or topics offers no opportunity for early intervention if and when students are falling behind as assignments are often set to be handed in towards the second half or end of the semester.

Table 2. Models of Assessment Employed in Applied Data Communications in ACU

| **Model_04 (fragmented assessment)** | **Model_05 (fragmented assessment)** | **Model_06 (continuous assessment)** | **Model_07 (continuous assessment)** |
|---|---|---|---|
| Assignment (20%) | Assignment 1 (20%) | Weekly lecture participation (1% each) | Online discussions & tutorial presentations |
| Mid-semester exam (30%) | Assignment 2 (20%) | Weekly In-class Assignments (2% each) | Weekly quizzes (2% each) |
| Final Exam (50%) | Assignment 3 (10%) | Weekly quizzes (2% each) | Weekly lecture participation (1% each) |
| | Final Exam (50%) | Mid-semester Exam (20%) | Mid-semester Exam (20%) |
| | | Final Exam (40%) | Final Exam (40%) |

Model_04 offers little variation in assessment methods, which is a disadvantage for students. Even though Model_05 replaces the mid-semester exam by two assignments, it is very similar to Model_04, consisting of assignments and exams.

### MODEL_06 AND MODEL_07

"Learn from your students' mistakes. Use assessment to discover their misunderstandings, then modify teaching to address them." [Ramsden, 2003 page 211] Model_06 serves the purposes of the above statement. Indeed, that is the reason for designing Model_06 and then Model_07. Model_06 not only offers continuous assessment but it also employs a suite of assessment tasks giving students more opportunity to score marks.

## VI. RELATED WORK

Some literature on the teaching of Data Communications / Computer Networking discusses studies on how to enhance student learning of the subject through hands-on exercises, such as through Visual Route and Virtual Network Computing software suites [Rajaravivarma, 2007].

In Rosenberg and Koo, 2002, a set of communications networking laboratory experiments were used to "emphasize the understanding of the dynamics of network protocols in addition to their applications…". Dixon and Koziniec, (2002) recommended using OPNET to enhance student learning in Data Communications course

This is a good idea for advanced data communications subjects but not for the introductory ones. Inclusion of laboratory experiments of any kind before attainment of "a solid theoretical foundation" would place extra burden on students, resulting in students adopting the surface approach to learning. However as Leung and Pilgrim (1995) proposed, using multimedia animation as an enhancer to learning the complex concepts in Data Communications is very helpful tool.

## VII. CONCLUSION

This paper presents concepts of study from three studies. Based on these models of concepts, we devise a model for teaching Applied Data Communications. Without compromising curriculum standard, we designed a teaching model to encourage students to make optimal use of their time in lectures and tutorials. This model ensures that course objectives of Applied Data Communications are clearly aligned to assessment tasks. Furthermore, these tasks are deployed

every week giving rise to continuous assessment facilitating early intervention when students do not meet the desired learning outcomes. Thus, the assessment models, Model_06 and Model_07, facilitate "the best ways to teach students in relation to what we know about how they learn actual subject matter in the everyday setting of classes and assessment." [Ramsden, 2003].

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