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Surface and Deep Learning Approaches within the Framework of Constructivism: A Theoretical Analysis

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Abstract: *Lecturers want to teach students and the students want to learn. However, there always seems to be a tussle between teaching and learning for examination on one hand and teaching and learning for comprehension and understanding on the other hand. This evokes several teaching and learning approaches. These may be summed up to be either the surface or deep learning approach respectively. The surface learning approach is characterized by rote learning whereas the deep learning approach is student-centered and allows the students to construct and apply knowledge on their own under the guidance of a lecturer. The active involvement of learners in the teaching and learning process resonates with constructivism. Constructivist principles recognize learners as the main focus of any teaching and learning situation by allowing them to explore their environment. There is a symbiotic relationship between deep learning, constructivism and self-regulated learning. It has also been noted by scholars that he Constructive Alignment theory (CA) as well as the '3P' (presage, process and product) learning and teaching model are intended to stimulate the deep learning approach to academic work.*

Key words: Surface learning; deep learning; constructivism; self-regulated learning; CA theory; '3P' theory

1. Introduction

Teaching in a university can be exciting but also quite challenging. Teaching in a continuous assessment system can even be more challenging and mind boggling. The lecturer is expected to deliver course content whilst at the same time ensuring that students are assessed formatively towards their final grade. The students also have a desire to learn and understand the course content while at the same time ensuring that they have accumulated good marks towards the final grade. This creates a tussle between teaching and learning for examination on one hand and teaching and learning for comprehension and understanding on the other hand. Hence the continuous assessment system gives rise to a variety of teaching and learning approaches on the part of lecturers and students respectively. The critical issues to consider is whether such teaching and learning approaches are constructivist in nature or not.

2. Literature Review

It is from the emphasis that is given by an assessment system that we get different approaches to teaching and learning. Weurlander et al. (2012) assert that assessments which focus on recall of factual knowledge tend to steer students towards surface learning. On the other hand, they insist that assessments which emphasise application and comprehension tend to encourage deep learning.

The characteristics of surface and deep learning are clearly articulated by Rust (2002: 8-11). In the surface approach to learning, the student or rather the lecturer reduces what is to be learnt to the status of unconnected facts to be memorized. In other words, rote learning is the order of the day. This means that the lecturer's focus is to make students reproduce the subject matter at a later date. Course characteristics associated with a surface learning approach are: (1) heavy workload, (2) Relatively high class contact hours, (3) an excessive amount of course material, (4) lack of opportunity to pursue subjects in depth, (5) lack of choice over subjects and (6) lack of choice over the method of study (p. 10).

When such characterise any assessment system then constructivist principles are ignored. Constructivist learning theory recognises that the learners construct meaning out of an interactive learning environment that includes lecturers, peers and learning materials (Keengweet al., 2013). According to Taber (2011), the constructivist perspective on learning is based on how people make meaning of their interaction with the environment. Barret and Long (2012: 76) likewise argue that a learner in a constructivist environment must actively build content and new knowledge. Students must be active participants in the learning process thus enabling them to explore the opportunity to construct knowledge on their

own. The surface learning approach does not realistically provide such opportunities.

On the other hand, the deep approach to learning is student-centred. This is defined as the student attempts to make sense of what is to be learnt, which consists of ideas and concepts and involves the student in thinking, seeking integration between components and between tasks, and 'playing' with ideas (Rust, 2002). Course characteristics which can foster a deep approach according to Rust (2002: 10) are (1) the engendering of intrinsic motivation in the students; students wanting and needing to know, (2) learner activity, (3) interaction with others, (4) well-structured knowledge base – i.e. where content is taught in integrated wholes and (5) where knowledge is required to be related to other knowledge.

The deep learning approach has been closely followed over the years by several scholars especially with the intention to re-echo its value in higher education. Among these, Howie and Bagnall (2015, p. 351) associate the following characteristics to the deep approach to learning: (1) students feel a positive regard for the program material, (2) students enjoy the process of engaging with the program material, (3) students require a requisite level of intention to engage with the program material.

Students' intention to engage with the program material may arise from (1) student's own curiosity, (2) a resolve to do well, (3) having relevant background knowledge, (4) an ability to work at a high cognitive level and (5) a preference for working conceptually.

The deep learning approach is cast in constructivism and therefore it should lead to self- regulated learning. Self-regulated learning is already constructivist in nature because of the approach that learners (and lecturers assume). According to Nussbaumeret al., (2015: 19), self-regulated learners are active and able to control, monitor, and regulate their cognition, their behaviour and their context. They are also ready to set goals and try to achieve them through progress-monitoring.

There is thus a close relationship between the deep learning approach and self-regulated learning both of which are constructivist in nature. This may be conceptualised as shown in Table 1 in which the deep learning approach (Howie and Bagnall, 2015), is compared with constructivism (Kwan and Wong, 2014) and the self-regulated learning principles (Nussbaumer et al., 2015). Constructivist principles are sandwiched between characteristics of students who pursue the deep learning approach on one hand and those who are self-regulated learners on the other hand.

The table shows that learners who are active participants in their learning (constructivism) feel a positive regard for the program material (deep learning approach) and are able to control, monitor, and regulate their cognition (Self-Regulated Learners). They (Self-Regulated Learners) are able to control, monitor and regulate their cognition and thus enjoy the process of engaging with the program material (deep learning approach). Through social interaction (constructivism) students are able to control, monitor and regulate their behaviour (Self-Regulated Learners) and thus reach the requisite level of intention to engage with the program material (deep learning approach).

Still in Table 1, it is also shown that individual students make sense of information for themselves (constructivism) and are able to control, monitor and regulate their context (self-regulated learners) because of their own curiosity and the resolve to do well (deep learning approach). Such individuals can set goals and try to achieve them through progress monitoring (constructivism; self-regulated learners) because of their ability and preference to work conceptually and at high cognitive level (deep learning approach). Although the three sets of principles/characteristics may be crisscrossed, the comparison shown in Table 1 still portrays their close relationship.

Table 1: The Deep Learning Approach, Constructivism and Self-Regulated Learning Compared

Howie and Bagnall (2015) The Deep Learning Approach	Kwan and Wong (2014) Principles of Adopting Constructivism	Nussbaumer et al., (2015) Self-Regulated Learners
Students feel a positive regard for the program material	Learners are active participants in their learning	Control, monitor, and regulate their cognition
Students enjoy the process of engaging with the program material	Learners are self-regulated	Control, monitor, and regulate their motivational state
Students require a requisite level of intention to engage with the program material	Social interaction is necessary for effective learning	Control, monitor, and regulate their behavior
A student's own curiosity. A resolve to do well. Having relevant background knowledge.	Individuals make sense of information for themselves	Control, monitor, and regulate their context

An ability to work at a high cognitive level A preference for working conceptually	Set goals and try to achieve them through progress-monitoring

Adapted from Howie and Bagnall (2015), Kwan and Wong (2014) and Nussbaumer et al., (2015)

The possibility of obliterating the surface learning approach in institutions of learning may not be immediate due to the prevailing practices and tradition. Nevertheless, the degrees of manifestation for these two approaches needed to vary so that the deep learning approach could get the pre-eminence. Scholars have suggested other innovative ideas intended to stimulate the deep learning approach to academic work. These include the Constructive Alignment theory (Biggs and Tang, 2007) and the '3P' learning and teaching model (Biggs, 1987; Biggs, Kember, and Leung, 2001).

The following features of the constructive alignment theory are stressed by Wanget al., (2013: 477):

- Clear specification of intended learning outcomes.
- Designing of the learning activities appropriate for the intended learning outcomes.
- Designing of appropriate assessment tasks to enable students to construct their knowledge to achieve the outcomes.
- Establishment of assessment criteria and
- provision of feedback to the learners for students' continuous improvement.

In like manner the '3P' (presage, process and product) learning and teaching model as proposed by Biggs, Kember, and Leung (2001) is depicted as follows by Wang et al., (2013: 478):

- The presage stage refers to personal factors such as motivation, conceptions of learning, prior knowledge, ability, age and personality as well as situational factors such as the teaching and learning environment.
- Process refers to the stage during which learning takes place – students are engaged and involved in active learning activities and instructors provide formative feedbacks for students to help them to reach the intended learning outcomes.
- The product refers to various demonstrable learning outcomes, such as course grades, demonstrable changes in skills and attitudes, students' satisfaction and students' approaches to learning.

The two sets of characteristics do vividly manifest constructivist attributes in the constructive alignment theory and the presage, process and product ('3P') model respectively. This is displayed in Table 2 where the constructive alignment theory (CA), the presage, process and product ('3P') model are paired with constructivist principles (Kwan and Wong, 2014).

Table 2: The Constructivist Nature of The CA Theory and The '3P' Model

Biggs and Tang (2007)	Biggs, Kember, and Leung (2001)	Kwan and Wong (2014)
CA Theory	'3P' Model	Constructivist Principles
Clearly specified intended learning outcomes	The presage stage -Personal factors, such as motivation, conceptions of learning, prior knowledge -Situational factors such as the teaching and learning environment	- Learners are active participants in their learning - Learners are self-regulated
Designed learning activities appropriate for the intended learning outcomes	Process stage-learning takes place and students are involved in active learning	- Social interaction is necessary for effective learning - Individuals make sense of information for themselves
Designed appropriate assessment Established assessment criteria and feedback to the learners	The product stage-various demonstrable learning outcomes such as students' approaches to learning	

Adapted From Biggs and Tang (2007), Biggs, Kember, and Leung (2001) and Kwan and Wong (2014)

Each one of the constructivist principles should be assumed to equally apply to any of the characteristics of the CA theory as well as the '3P' model. For example, individuals can make sense of information for themselves (constructivist principle) being prompted by personal and situational factors such as motivation and classroom

environment respectively, ('3P' model), in which intended learning outcomes are clearly specified (CA theory). Likewise, social interaction for effective learning (constructivist principle) can take place at the process stage where students are involved in active learning (('3P' model) since activities appropriate for the intended learning outcomes have been designed (CA theory). Accordingly, the CA theory and the '3P' model are constructivist in nature and should be able to induce deep learning in students.

3. Method

A number of sources were consulted in an attempt to establish the net effect of deep and surface learning approaches vis-à-vis constructivist learning theory. This was done against the background of the literature that had been reviewed with regards to the two learning approaches. Several studies were then followed in order to gain insight of the realities on the ground. Purposive sampling was used. A random selection of articles related to deep and surface learning approaches was made in research journals. One related study was picked from several others within a seven-year period ranging from 2011 to 2017. Table 3 shows a summary of the journals that were searched and the articles picked together with the year of publication.

Table 3: List of Selected Journals

Journal	Article Title	Year
EuropeanJournal of Psychology of Education, 26(3):393- 415	The Perception of Workload and Task Complexity and its Influence on Students' Approaches to Learning: A Study in Higher Education	2011
Studies in Higher Education, 37:7, 811-824	Relations between students' approaches to learning, experienced emotions and outcomes of learning,	2012
Accounting Education, 22:6, 582-604,	The Experience of Deep Learning by Accounting Students	2013
Teaching in Higher Education, 19:7, 812-824	What impedes or enhances my studying? The interrelation between approaches to learning, factors influencing study progress and earned credits,	2014
Educational Psychology, 35:1, 53-72	Discipline social identification, study norms and learning approach in university students,	2015
Cogent Education Vol. 3, Iss. 1, 2016	Are marketing students in control in problem-based learning?	2016
Journal of Biological Education	Student-centered introductory biology course: evidence for deep learning	2017

4. Results and Discussion

It emerged from the search through the journals that several studies have been conducted with regards to the play, inter-play and counter-play between surface and deep learning approaches. Kyndtet al.,(2011) conducted a study to determine the factors that can enhance or inhibit a deep approach to learning. The participants were 128 second year undergraduate students in educational sciences. The researchers employed perceived workload and task complexity as the determinant factors.

It was hypothesised that a deep approach to learning would relate negatively to perceived workload, while surface approaches to learning would relate positively to perceived workload (Kyndt et al.; 2011: 397). Nothing was hypothesised for task complexity.

The students were given four tasks with various workloads and task complexities after which they filled out questionnaires on learning approaches, perceived workload and perceived task complexity (Kyndt et al.; 2011: 397). Although the students were given assignments to induce workload and task complexity, it was discovered that the lack of information turned out to be a discouraging factor for inducing a deep learning approach. This was so regardless of the induced workload and task complexity.

The results of the study by Kyndt et al. (2011) seem to confirm the assertions by other scholars in connection with the surface learning approach. According to Rust (2002), this is characterized by a heavy workload and an excessive amount of course material wherein students have a lack of opportunity to pursue subjects in depth (lack of information).

The surface learning approach may easily become a near resort for instance in the case of continuous assessment where formative assessment is used for summative purposes. In such a situation, students could opt to rote learning by use of mnemonic devices for the sake of getting good marks in a quiz or test. The study by Kyndt et al. (2011) is an eye opener in terms of knowing how to

engage students and how to assess them in the learning process so as to avoid such occurrences.

Deep and surface learning approaches may also be related to the emotions that the students experience in a given course of study. Trigwell et al. (2012) carried out a research at the University of Sydneyto establish the relationship between the emotions that students experience in a first year university course, their approaches to

learning in that course, and their academic performance in that course. Their sample consisted of 388first year biology students. They were made to complete the Revised Study Process Questionnaire (24 items), and the trial version of the Student Experience of Emotions Inventory (31 items), in relation to one of the four courses (a biology course) in which they were enrolled. The results of correlation analyses, principal components factor analyses and cluster analyses showed significant relations between students' emotional experience, their approaches to learning and their learning outcomes. They argued that the learning environment will evoke emotions to which students can react positively or negatively. Such reactions are the ones which determine whether a student adopts the deep or surface learning approach.

Talking about the experiences of students in a learning environment brings to the fore issues of student-teacher interaction. How the lecturer facilitates the learning process, including assessment, leads to the deep or surface learning approaches depending on how supportive the learning environment is. A study was conducted by Turner and Baskerville (2013) to provide evidence of whether, and if so in what ways, accounting students can be supported to experience deep learning. It involved 81third-year undergraduate accounting students. These were taken through course assessment involving individualised, authentic learning tasks with regular formative and summative feedback, as part of an integrated set of interventions (Teamwork, Teacher-Student Relationship and Instruction).The researchers embraced the influence of the Constructive Alignment (CA) theory by including measures to support student learning experiences in the assessments. The results of this study by Turner and Baskerville (2013: 588)revealed that a large proportion of students experienced deep learning in an accounting course; and that they began to experience deep learning at an early stage in the course.

Another study to substantiate the role of Constructive Alignment theory and the '3P' learning and teaching model in relation to the deep and surface learning approaches was carried out in Hong Kong by Wang et al., (2013). A focus group was chosen from among a sample of lecturers and students from two different programs in a university. These were divided into two groups one of which was more akin to constructive alignment and the '3P' model. Students in group A with the help of their lecturers took courses which were more constructively aligned than those in group B. The researchers analysed course syllabi and interview data from both students and lecturers.

The results indicated that students in group A adopted more of the deep learning approach and less of the surface learning approach. Those in group B exhibited more of the surface learning approach. It was thus concluded that the constructive alignment theory and the '3P' model played a significant role in inducing the deep learning approach to study in the students. The constructive alignment of teaching and learning outcomes, activities and assessment tasks creates an effective teaching and learning environment (Wang, 2013).

Surface and deep learning together with students' experiences of enhancing and impeding factors maybe related to students' study progress. In a study to validate these assertions Hailikari and Parpala (2014) used a sample of93 second year students from the Faculty of Arts and Humanities to answer a Learn-questionnaire regarding their experiences of the enhancing and impeding factors and their approaches to learning. The results revealed that working and finding the teaching interesting were the only factors that were directly related to students' study progress. The deep approach was related to having a high interest in and enthusiasm for studying whereas the surface approach was related to low self-efficacy and experiencing the guidance as insufficient. It was recommended that students be helped to develop their self-regulation skills which may be enhanced by creating learning environments that support the autonomy of students, Hailikari and Parpala (2014: 819). This is in unison with the principles set out in the constructivist learning theory (Kwan and Wong, 2014).

The need for a constructivist learning environment comes to the fore once again in terms of discipline social identification and educational norms on the adoption of either the deep or surface learning approach. This was realised in a study carried out by L. Smyth et al. (2015) involving a mixture of 293 undergraduate students from several academic disciplines. The researchers collected data to measure five items namely; students' identification with their fellow students in their particular field of study, students' learning approaches, perceived learning approach norms, teaching quality and personal-level factors such as conscientiousness. The overall result of the study attested to the strong effect on the students' approaches to learning of their salient self-concepts, their salient discipline-related self-concepts and the norms embodied in the learning environment.

Problem based learning is a teaching strategy that may be used to conjure up deep learning approaches in students. A study to investigate how a problem-based learning (PBL) environment impacts on self-efficacy, learning behaviour, and performance outcomes as well as on how these relate to each other was carried out by Geitz et al. (2016). This involved 105 first year marketing students who were divided into 12 tutor groups. Experiment and control groups were used in the study. These were exposed to various activities within a PBL environment. Two questionnaires were used namely; 1).The translated self- and task-perception questionnaire (STPQ-scale) to measure self-efficacy and 2). The validated translated version of the Revised Study Process Questionnaire (R-SPQ-2F) to measure learning behaviour (i.e. deep and surface learning). The results showed that PBL was able to influence self-efficacy and learning behaviour in order to increase performance outcomes. Deep learning behaviour

was evoked in all the students especially in the experiment group. Problem-based learning creates a deep learning approach in students because they learn by discussing professionally relevant problems enhancing application and integration of knowledge, Dolmans et al. (2016).

In a similar vein it is worth noting that constructivist learning theory advocates for student-centred learning as a way to enhance deep learning in the students. Tal and Tsaushu (2017) conducted an interpretive study in which they developed and implemented an alternative instructional model in order to examine the ways students in an introductory biology course perceived their learning. This was comprised of a three-phase intervention. In the first phase of the intervention, a course was added to the website that served as a resource in addition to the regular lectures. In the second phase, students were required to learn contents via the course website before each lesson. Lessons still took place as lectures, but students knew in advance that the instructor will not cover all the content, but rather, delve deeper into more complex topics and abstract principles that cut across topics. In the third phase, the number of lectures was cut to 30% of the number before intervention, comprising mainly an introduction and a wrap-up of the course. The time saved was recommended for independent learning, using the online tutorial. The main new component was a group-study of one topic, Tal and Tsaushu (2017).

The results of the study according to Tal and Tsaushu (2017) showed that various features of deep learning were demonstrated, which can be associated with the transformation of the Biology 1 course from lectured-based, to individual and small group learning. They suggested the main features associated with deep learning to be;1). Meaningful learning activities experienced by the students; 2). Team discussions; 3). Knowledge representation and metacognition; 4). The transition from lecturing to mediating.

5. Conclusion

This is what constructivist learning is all about. It goes without saying therefore that constructivism is the template to use in the selection of a teaching and learning approach. The deep learning approach resonates very well with the Constructive Alignment theory, the '3P' learning and teaching model and self-regulated learning. These are all cast within the framework of constructivism. They also lead to self-regulated learning. Deep learning can only come as a result of creativity and hard work on the part of both the lecturers and the students. The lecturers must develop innovative ways of motivating students to learn for comprehension and understanding rather than for examinations.

6. Recommendations

This study is the tip of an iceberg with regards to deep and surface learning within the context of constructivism. It also recognises that not so many empirical studies have been carried out on the African continent wherein constructivism is part of daily activity. Constructivism is all about social interaction within an ongoing activity whether it is working, learning and even playing. It is recommended that more experiments be conducted in this region touching on various aspects in which deep and surface learning may be explored. These include areas such as but not limited to metacognition, motivation, self-regulation and self-regulated learning.

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