Mind the gap: Cognitive active learning in virtual learning environment perception of instructors and students

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Abstract

The use of a virtual learning environment is increasingly gaining popularity with universities among students and instructors. VLEs is said to increase flexibility and promote independent learning. However, the pedagogical effects and the contribution of instructors in student's experience of cognitive active learning in these online classrooms is worth investigating. This paper seeks to explore the disparity between students and the instructor's perception of cognitive active learning experience in a VLE. Consequently, this paper utilizes a phenomenological constructivism approach by using interviews and questionnaires as the primary method of data collection. The results show that instructors believe students are often not intrinsically motivated and consequently do not automatically experience deep learning in the VLE without the appropriate instructional support. The instructor must stimulate deep thinking with a well-formed and probing questions or comments which promotes critical thinking and knowledge transference. This highlights the disconnect between the two instructors and learners in the expectations, attitude towards learning, and the learning environment.

Keywords Cognitive active learning · Instructors · Students · Surface learning · Virtual learning environments

1 Introduction

Personal computers and the Internet have not only revolutionized the world but have transformed the way students learn. This education paradigm is often called virtual learning, and it has the potential to improve student achievement, educational access, and cost-effectiveness. Advocates of these types of learning environments argue that

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they could potentially eliminate the barriers to learning by providing increased convenience, flexibility, the currency of material, student retention, individualized learning, and feedback over traditional classrooms (Chou and Liu 2005). Nonetheless, despite the emphasis on the potential benefits of virtual learning environments (VLE), some drawbacks have been identified, namely learner's feeling isolated, frustrated, anxious and confused (Hara and Kling 2000).

The principle of deep learning, otherwise called cognitive active learning, is 'true knowing,' that is developing an understanding of the subject matter. When experiencing cognitive active learning, students transform the knowledge they gained by exploring it beyond the central concept. Hence, deep learners aim to develop a profound understanding of the subject matter rather than surface learners. Practitioners of deep learning interact with the material by creating relevant arguments and drawing practical examples from their daily lives. Therefore, rather than rote memorization, they critically engage with the subject matter and retain the material in their long-term memory (D'Mello et al. 2010; Ke and Xie 2009).

Despite the buildup about VLEs, it is essential to assess whether students experience deep learning in these environments — studies done by Smith and Colby (2007), Platow et al. (2013), Reinhardt (2010), Mimirinis and Bhattacharya (2007), Smart and Cappel (2006), amongst others have looked at deep learning regarding teaching and learning in general or online. However, none of these studies have considered bridging the gap between the instructor's perception of students experiencing deep learning and student's experience of deep learning. Hence, this paper investigates the instructor's perception of how students learn and study in a virtual environment. It also examines students learning engagement in online courses and explores their perception of experiencing deep learning. The paper achieves this by interviewing instructors and students as well as making use of a cross-sectional survey to the student body of two local universities. Consequently, this study seeks to address two research questions. Firstly, the interviews with instructors seek to determine: What role instructors play in supporting students to experience deep learning in VLE? Secondly, the questionnaire seeks to determine the student's attitude and perspective when participating in a VLE?

Therefore, using phenomenological constructivism and a mixed method approach this paper made use of qualitative research using interviews to elicit the perception and perspectives of instructors as well as the quantitative survey to determine the perception of student's experience in a VLE.

2 Virtual learning environment

On account of Internet-penetration, network access is ensured for almost all users. Consequently, ICT-based solutions have increasingly appeared, with the emphasis on learning environments, as well as in communal and collaborative engines. As a result, universities and developers are taking full advantage of these settings and are increasingly offering courses using VLEs. Examples of these VLEs include Blackboard or even open source access such as Moodle. They are sometimes used as a repository for providing students with access to materials, such as PowerPoint files and reading lists, but are primarily used to provide, interaction and self-dependent studies. A virtual

learning environment is designed to support teaching and learning activities across the Internet (Jain 2015) and generally comprises of the following (Molnár 2013):

- Communities, organizing communities;
- Blogs, microblogs: blogger, WordPress, and Twitter;
- Cooperative, collaborative, social hubs;
- Pictures, picture-sharing, infographics: YouTube and videos;
- Videos, streaming, podcasts, animation;
- Presentations, concept maps;
- Document editing and sharing;
- Geo-local information and services;

VLEs can be valuable learning spaces as they provide a range of educational opportunities. Hence, it is not surprising that early adopters of innovative teaching and learning have utilized them. Therefore, instructors have the opportunity to move from a teacher-centered to a student-centered model of instruction. In a student-centered model, learners use their experiences to construct understanding/meanings that make sense to them, rather than having this understanding delivered to them in an already organized form. It is, therefore, more personalized than the teacher-centered model as the intention is to address the unique learning needs, interests, aspirations, and cultural backgrounds of individual students and groups of students. Technological advances facilitate this student-centered approach as students can use multiple interactive technologies to demonstrate content and knowledge. Therefore, VLEs, present an excellent opportunity for students to create and discover knowledge as well as develop a more profound comprehension of the given content which facilitates cognitive active learning (Riley 2008). Also, according to McComas (2014) and Jain (2015) with VLEs:

- the instructor can track learner's engagement with the content;
- the educator can submit evaluations online and provide quick feedback;
- message services foster teamwork and communication both between the different parties;
- learners can interact more enthusiastically with the content at any place or time (Becta 2005).

VLEs offer universities an efficient delivery vehicle for several courses particularly in situations where there is a shortage of faculty and increasing student demand.

3 Teaching approaches to virtual learning environment

There are two approaches to teaching in a VLE. These are synchronous and asynchronous learning. Highly motivated instructors looking to create virtual learning environments frequently face organizational difficulties as classrooms typically embed asynchronous technologies that emphasize a singular model of lecture and material delivery (Warden et al. 2013; Yamagata-Lynch 2014). Asynchronous learning uses time-delayed capabilities of the Internet. It typically involves tools such as e-mail, threaded discussion, bulletin boards, and file attachments. The instructor facilitates asynchronous

courses but not in real time (Tyler and Zurick 2014). Therefore, students and instructor engage in course-related activities at their convenience rather than during coordinated class sessions. Students participating in asynchronous VLE often experience a sense of a lack of community and feelings of disconnect as the asynchronous communication can be less personal. The low level of social interactions with the instructor and delay feedback is a challenge to their experience of deep learning. Even in situations where students are willing to establish interpersonal and social relationships with instructors and peers, they do not always find it possible (Park and Bonk 2007; Tyler and Zurick 2014).

Synchronous learning, on the other hand, occurs in real time via the Internet. It involves tools, such as live chat, audio, and video conferencing, data and application sharing and joint viewing of multimedia presentations and slideshows. Despite the advances in the technologies and Internet connectivity, critical synchronous aspects of an in-class experience remain challenging to implement. Students, while skilled at watching videos on demand and playing immersive virtual games, lack the experience of learning and engaging in formal synchronous learning (Cole 2009; Tyler and Zurick 2014). These online classrooms are dynamic on multiple levels as information is received in a variety of formats and styles. Students who are accustomed to learning in a more static and asynchronously environment this can create time management concerns.

Students are often ill-prepared to engage in meaningful dialogue, especially in an online learning environment where establishing a social presence is heavily dependent on peer interaction. According to Garrison and Cleveland-Innes (2005), teaching presence in the form of planned interaction and facilitation is critical to the success of online learning. Since the virtual learning environment differs from the physical classroom setting, it is essential that adequate and appropriate online training be provided to instructors as they to update their teaching skills, practices and strategies to accommodate the diverse needs of the learners (Yamagata-Lynch 2014). Such training helps to address the increase in the diversification of the student population.

4 Deep learning vs. shallow learning

Shallow or surface learning is characterized by an emphasis on meeting minimum requirements, employing low-level cognitive skills. It focuses on task completion rather than knowledge assimilation. Consequently, the learner relies on memorization of new ideas and reproduction of material and does not seek further connections, meaning, or engagement with the content (Prosser and Trigwell 1999; Entwistle 2003; Ke and Xie 2009). In this approach, learners are externally focused, which tends to result in the accumulation of unrelated pieces of information for assessment purposes, and temporary learning outcomes (Asikainen and Gijbels 2017).

Therefore, learners are unlikely to experience high-quality learning outcomes or develop appropriate skills and competencies. While all students are capable of employing or achieving any of the two approaches, they often choose strategies considered to be the most effective based on the requirements in that particular environment. Under the deep motivation of learning, the student aims to seek knowledge, whereas, under the surface approach, it is to acquire only enough knowledge to

complete the task. According to Biggs (1993), students can choose deliberately the approach that is most likely to result in the desired learning outcome. Cognitive active learning is a highly collaborative, integrative, self-reflective, and application-centered type of learning (Majeski and Stover 2007; Fink 2013). Therefore, cognitive active learning indicates that successful learning should engage and capture the—cognitive, social, and affective—in the learning process (Garrison et al., 2000; Fink 2013). Hence, active participation in interactions becomes a significant component of online learning activity (Cercone 2008; Entwistle 2003). For learning to be effective, it requires congruence between the objective and strategy adopted. Consequently, a student cannot, simultaneously, choose a surface and a deep approach while studying the same content study.

Interaction with course content is central to an educational experience and is a primary focus in studying in a virtual learning environment. The emphasis on interaction emerges from the identification of the properties and opportunities that the new technologies provide to support sustained educational communication. The purpose of any educational experience, whether it is online, face-to-face, or hybrid is to achieve defined learning outcomes. Hence, interaction within the VLE must be more structured and systematic with the intent to influence thinking critically and reflectively. However, communication in such an environment goes beyond social interaction and the simple exchange of information but must include exploration, integration, and testing of concepts, having a social presence, and creating interrelationships. According to Garrison and Cleveland-Innes (2005), deep and surface learning emerge from the combination of student motivation and strategies for learning. These motivation strategies are either extrinsic or intrinsic motivation.

5 Cognitive active learning in a virtual learning environment

Multiple factors will impact either positively or negatively the learner's approach to learning in the VLE. Education researchers in trying to understand how students learn in VLEs have assessed students' learning experiences and how they made sense of assigned tasks. In addition to student involvement and intention, the instructor's interest and support are also vital to provide the opportunity to manage student's learning. Surface learning is more likely to emerge when assessment methods are geared towards replicating information, or anxiety and a heavy workload (Asikainen and Gijbels 2017). According to Mimirinis and Bhattacharya (2007) a relationship exists between higher quality learning outcomes and a deep approach to learning (Dolmans et al. 2016; Postareff et al. 2015) and a student-focused approach to teaching. Therefore, students are unlikely to experience cognitive active learning unless they first experience high-level relevant structures and concepts of learning (Turner and Baskerville 2013). Also, unless students first experience deep learning, they are unlikely to make the cognitive effort to experience a change in personal capabilities. Once initial deep learning has occurred, students can then make choices about their learning and contribute to the design of the learning experiences. VLEs support the student learning experience as they have the potential to enhance teaching and learning, encourage student-centered and independent learning as well as to foster a deep approach to learning (Mimirinis and Bhattacharya 2007; Van Raaij and Schepers 2008).

Experiencing deep learning is strongly associated with intrinsic motivation; and surface learning is strongly related to extrinsic motivation (Ryan and Deci 2000; Hall et al. 2004; Pintrich 2004). Active learning as an educational process is the practice that creates aptitude and more in-depth understanding that increases student intrinsic motivation (Banfield and Wilkerson 2014; Muntean 2011). Therefore, the experience of deep or surface learning depends on:

- the focus of attention, student vs. instructor focus;
- the intention of the learner and expectation;
- the level of interest developed and maintained by the learner throughout the course;
- support received for the instructor/tutor;
- the enthusiasm of the instructor;
- flexibility in learning and organizational skills
- assessment methods;
- anxiety or workload levels;
- students had an opportunity to manage their learning (Postareff et al. 2015; Dolmans et al. 2016).

In addition to the quality of learning outcomes, and the approach to teaching and learning, the dynamic characteristics that individual learners bring to the VLE also determine the type of learning approach students experienced. Learners who prefer independent studying and develop a positive attitude toward VLE are more likely to experience deep learning. Alternately, surface learners tend to complain about a lack of time and will often not complete the online tasks (Hoskins and van Hooff 2005).

From a design and development perspective, a well-maintained VLE should enable students regardless of learning styles to receive the best possible education by using resources which caters to the needs of the students, both regarding format (text, audio, videos, amongst others) and content (Van Raaij and Schepers 2008). Therefore, these environments should contain enough information to allow students to reinforce their understanding without providing information overload (Demian and Morrice 2012). From the discussion it is evident that students experience cognitive active learning in VLEs via many ways, these according to Mahoney and Schamber (2011) are achieved by through interdisciplinary connections which promotes a deeper understanding of the material. These links facilitate active learning through application and knowledge transference.

6 Research methodology

Phenomenological constructivism (PC), seeks to understand and explain the social world from the standpoint of the actors involved in the social process (Annansingh and Howell 2016) where the social world is continuously developing and changing. PC consists of a network of assumptions and shared meanings. In this paper, through PC the researcher seeks to understand the perceptions and perspectives of instructors and students who are involved with the use of VLEs, recognizing that each group of actors will develop shared meanings that are more subjective than objective.

This research adopts a mixed method approach where the researcher draws inferences using both qualitative and quantitative methods in a single study (Teddlie and Tashakkori 2009). Consequently, a mixed method approach promotes greater understanding of findings as the quantitative data is used to demonstrate that change occurred and by how much, while qualitative data helps to understand why this change occurred. Thus, it provides a better understanding of a phenomenon from multiple perspectives (Creswell and Miller 2000; Creswell 2009). Using a mixed method approach has several distinct advantages, namely: triangulation, complementary, initiation, development, and expansion, which promote a greater understanding of the research problem and findings (Creswell 2009). One of the goals of this research was to achieve triangulation of methods. Triangulation was used to increase the accuracy of the interpretation of the findings by testing the validity and reliability of the results by ensuring that they are not due to circumstances or chance (Johnson et al. 2007; Teddlie and Tashakkori 2009).

Triangulation is a validity tool where researchers search for convergence among multiple sources across data sources, theories, investigators, and methods to form themes or categories in a study (Johnson et al. 2007. In this study, methodological triangulation was achieved by employing both qualitative (interviews) and quantitative (descriptive statistics) as seen in Fig. 1.

The interviews and questionnaires were conducted in two colleges. One of the colleges is a community college offering to are two-year degree program and was founded in 1963 and offers programs aimed at the business community. The second is a four-year college which offers more than 40 major disciplines including Accounting, Chemistry, Communications Technology, Computer Science, Economics, English, Fine, and Performing Arts, Foreign Languages, and Women's Studies. Both colleges are state-owned and depend heavily on public funding.

6.1 Interviews

An interview is a controlled situation with an exact purpose, which must at least be apparent to the interviewer – as this determines the direction of the interview (Silverman 2016). Interviews are excellent sources for providing insights into people's experiences, opinions, values, aspirations, attitudes, and feelings. The interviews with
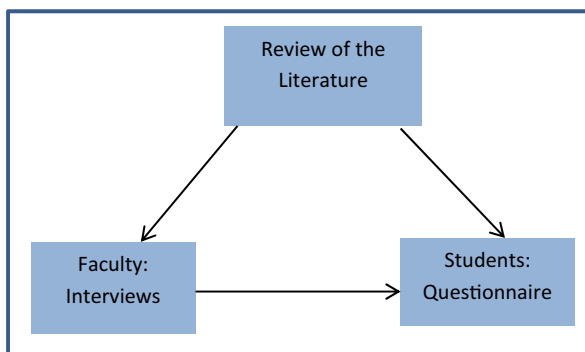

Fig. 1 Research process: methodological triangulation

the faculty members had outlined objectives which were prepared to assist in the development of the interview questions. When it was determined that the questions were on the objectives, they were discussed with the interviewee to ensure that both the researcher and the interviewee had a proper understanding of both the focus and the direction of the interview. Semi-structured interviews were used in addition to the predetermined questions, probing questions were asked (Wildemuth 2016). General open-ended questions were selected as they provide the interviewees with complete freedom to reply to the questions. Open-ended questions also allow the interviewer the chance to probe for more in-depth responses (Wildemuth 2016; Silverman 2016).

Consequently, exploratory interviews were conducted with eight instructors of online classes to determine how they maximize pedagogical opportunities in a virtual learning environment to enhance active learning. Consequently, this study seeks to address the following research question: What role do instructors play in supporting students to experience deep learning in VLE? The motivation for the study is to provide evidence of whether, and if so in what ways, students can be supported to experience deep learning. Instructors are principal actors in any learning environment their positive attitude toward technology, teaching style, and their control over the technology will determine the attitudinal measures of learning effectiveness (Cavanaugh et al. 2000). Since VLEs are computer-based that permeates the students' learning experience, instructor behavior, regarding attitudes and actions, can have a significant influence on students' reactions to the learning environment (Piccoli et al. 2001). Hence, interviews were conducted with faculty members from two US institutions to obtain their perception and perspective on their role in students achieving deep learning in the VLEs.

6.2 Data analysis

Data analysis of the interviews begins with the identification of key themes and patterns (Coffey and Atkinson 1996). Based on the interviews, data analysis was done using a question by question summary. Following this, open coding was used to detect, label, categorize, and describe the relevant themes discovered in the interview scripts. Axial coding is used to identify the relationships between the different categories of data emerging from the open coding process. The relationship between categories was organized based on a hierarchal classification (Thornhill et al. 2009).

6.3 Cross sectional questionnaire

The research employed a cross-sectional survey to collect information about a population of interest. The questionnaires consisted of a predefined series of questions used to collect information from participants by querying students registered for an undergraduate program (Bell et al. 2018). Students from two American based universities were asked to participate in the online survey by contacting their instructors. The questionnaire was anonymous as it had no identifying marks. Neither was any data collected on the institution from which the students attended. Unstructured, open-ended questions were employed since they encourage participants to construct their meaning of the phenomena. Thus participants express their views since there were no predetermined responses (Annansingh and Howell 2016). Closed questions were employed to

triangulate the findings between the literature and the interviews. The majority of these closed-ended questions were multiple choices, where participants were required to consider all possible responses. Two hundred fifty valid responses were received from the questionnaires.

6.4 Data analysis –survey

Data analysis employed the use of univariate and bivariate descriptive data analysis, and both techniques involve the use of techniques which includes: frequency counts and distributions, frequencies and comparison between categories, distributions and contingency tables/correlations (Saunders et al. 2009).

The interviews and questionnaires were conducted in two colleges. One of the colleges is a community college offering to are two-year degree program and was founded in 1963 and offers programs aimed at the business community. The second is a four-year college which offers more than 40 major disciplines including Accounting, Economics, Chemistry, English, Communications Technology, Computer Science, Fine, and Performing Arts, Foreign Languages, and Women's Studies. Both colleges are state-owned and depend heavily on public funding.

7 Presentation of findings

The results of the interviews and questionnaires indicate that pedagogy rather than technology must be the driving force behind the content development of VLEs if learners are to experience deep learning.

7.1 Cognitive active learning in virtual learning environment

From the literature, deep or active learning must be integrative, self-reflecting, experiential, self-assessing as it develops and promotes the whole person (Mahoney and Schamber 2011). Hence, the analysis of the data began with the instructor's incorporation of pedagogy and quality learning outcomes in the VLE. All the instructors indicated providing students with a syllabus, lecture notes, discussion areas, thus facilitating class participation and collaboration as well as general announcements.

> *My online course syllabus is more detailed and comprehensive… I want students to know all my expectations and instructions for them... It also saves time …[] as students will ask me fewer questions about things that are already there (in the syllabus). Interviewee 7.*

The instructor's roles in ensuring that both the environment and content support active cognitive learning were solicited. To assume that deep learning occurs because environmental conditions are met is a fallacy that should not be taken for granted. Consequently, instructors were questioned on how they ensured that deep learning occurred in an online environment. The feedback was insightful as the instructors utilized several techniques:

… []"assignments or tests which relies on memory are low stakes..[] they (low stakes activities) are worth only 10% of the course." (Interviewee 1)

..[] "discussion questions are based on application or case studies. Specific questions force the students to think and interpret the material and apply it to everyday situations" (Interviewee 5).

…"I don't ask for definition… students are forced to think" (Interviewee 7).

*…[]I do ask multiple choice questions but there is also discussion and conceptual papers. The discussion board is also a useful tool". (*Interviewee 4*)*

*"I rely heavily on multiple-choice questions" (*Interviewee 8*)*

Providing students with written assignments such as conceptual papers is calculating move as studies have shown that the use of writing is an effective means to prepare students to experience deep learning as it requires preparation and encourages active participation (Du and Xu 2010). However, in an attempt to promote critical thinking and understanding, instructors should be cautious not to over-assess to provide excessive workload as this could lead to poor learning outcomes (Postareff et al. 2015). A vibrant online environment with too many hyperlinks, resources, and multimedia content does not guarantee the improvement of the student learning experience. Providing excessive materials could hinder students understanding of the learning process and material, thus reproducing surface approach (Mimirinis and Bhattacharya 2007). Despite the efforts by instructors in designing and developing a VLE which promotes deep learning only 32% of students did additional research around the subject matter, the remaining 68% relied solely on the lecture slides and handouts.

In a traditional classroom, students can quickly ask an instructor to clarify fuzzy concepts. In an online class, answers to those crucial questions are delayed, sometimes causing frustration, therefore, reducing the motivation to learn as it can prove challenging for students to engage substantively with the content (Young 2006). Therefore, the quality of the course content must be of a high standard, and any assignments/ assessments meaningful. When either assessing or evaluating student learning, an appropriate strategy should focus on inquiry, analysis, synthesis, application, and critical thought rather than simple memorization of information. From the questionnaire, 38% of students were assessed using multiple choice questions, 28% short answers, 15% essays, and another 15% research papers. Studies have shown that multiple choice questions may potentially encourage surface approaches to learning (Biggs 2003; Ramsden 2003; Scouller 1998). Multiple choice questions test memory recall and promote rote memorization and are considered a superficial measure to assess understanding as it encouraged students to memorize isolated facts without understanding. Until instructors cease relying on questions that can be answered with details plucked from short-term memory, there is less chance that students will opt for the deep learning approaches. Essays and research papers are considered most conducive to deep learning.

Consequently, instructors need to pay attention to the desired use of online assessment and appropriate adjustments made where necessary. Deep learning strategy

should be designed into the course rather than through happenstance. Cognitive active learning occurs when learners write their study questions, figure out the answer before looking it up, and attempt to break down complex processes step-by-step analysis. VLEs are not always suitable for all students and subject, especially those of a quantitative nature.

> *I don't believe we are interested in students learning when we offer quantitative (Mathematics, Accounting and Statistics) classes online. [..] when offered online these classes fill up first as students know they can cheat by searching for answers online without developing an understanding for the content. When they come to the next level class they struggle (Interviewee 7).*

The timeliness of the feedback and the quality of responses is also considered relevant to students experiencing deep learning. When students receive immediate feedback and detailed explanations in response to work, it promotes a positive learning environment. The use of scaffolding or providing adequate feedback before, during, and after assessments and discussions can help students to better engage with the content as these provide self-regulated thinking and procedural guidance, clarify the ground rules, and guidelines on how to complete complex tasks (Dabbagh 2003).

> *...[] My responses are as a general rule within 24 hours. There are times when this is not possible* [Interviewee 2].

> *..[]In my course description I ask students to expect a response in 48 hours. I tend to post these responses on the discussion board as it benefits other students* [Interviewee 3].

> *…[] "I provide honest feedback as quickly as possible. This helps improve the next assignment. I also ask probing questions and force students to think more deeply about a topic"* (Interviewee 5).

Providing students with timely feedback also prevent or reduce inappropriate learning practices. If students do not fully understand the concept or are unable to apply knowledge, providing prompt feedback and guidance will help to change the perception and impact students' approach to future work, motivation or commitment (Higgins et al. 2002).

> *... [] "I follow the discussion threads on the discussion board and clarify or correct any erroneous view or comments". (*Interviewee 3)

> *...[]I'm very specific in my response to students when giving feedback (*Interviewee 2)

This rapid response and demand for feedback, however, could result in the instructors becoming overwhelmed with course management and interaction as they become bombarded with different communication, such as e-mail, threaded discussions, and chats from students. Likewise, instructors must work hard to meet

the varied needs and demands of students. Therefore, content or delivery of the material may suffer.

> []…"I sometimes receive more than 20 emails for the day when assessments are due. Some students prefer using emails rather than posting on the discussion board" (Interviewee 2).

The demands of communicating in a VLE can be overwhelming as the volume of e-mail messages alone can quickly escalate to the hundreds. Hence, it is imperative that instructors manage both student's expectations and increase their level of involvement in the course. Both parties can benefit from honest and open communication (Smart and Cappel 2006) as it provides another opportunity for learning. Open communication increases student performance as they obtain immediate feedback for their actions. Therefore, students can take control of their learning by monitoring their mastery of skills, comprehension, and by implementing strategies to improve their learning, and transference of knowledge. This emphasizes the need for excellent written and communication skills and the careful design of activities that promote analytical and rational discussion. Not only are summative feedback essential for providing students with a grade, but formative assessment help students identify knowledge gaps which leads to self-assessment, self-awareness, critical think and intrinsic motivation since the aim formative assessment is to assist the development of the learner, (Rushton 2005). The online environment, however, removes some of the human qualities that students have with the instructor, such as eye contact, facial expressions. Consequently, one instructor went as far as to meet with students.

> "… []when providing feedback I sometimes ask my students to come and see me even though it is an online class. They sometimes need to be going deeper into the material" (Interviewee 1).

This is not always feasible or even logistically possible. Consequently, most instructors utilize a purist approach where feedback is provided entirely online. How the feedback is given can influence students overall experience. Some instructors, in order to encourage critical and analytical thinking or more detailed discussion, often ask probing questions. These questions support active learning and allow the instructor to ask questions which students should be asking themselves (Smith and Colby 2007). Consequently, Interviewee 6 exemplified such practice:

> …[] I ask them a lot of questions, so they are forced to think about the process [Interviewee 6]

The instructors, however, must exercise caution as excessive probing can hurt the learning environment and experiences if, during the discussion, they maintain an authoritative tone when probing for more in-depth analysis and response. By adopting this strategy, the instructor may inadvertently hinder diverse views, negotiations, and social interactions. This inappropriate moderating behavior is often associated with the lack of skills and knowledge about online pedagogy

and helps to highlight the importance of faculty training for teaching in VLEs
(Park and Bonk 2007).

> ...[] it is mandatory for us to be trained (Interviewee 6)and Interviewee 7

> ....[]There is a training program at the college for all professors who want to
> teach online (Interviewee 5)

However, not all the instructors interviewed received training before teaching in the
VLE. Training should be mandatory to inform instructors not only of innovative
technologies but of prevailing pedagogical practices in these environments.

7.2 Attitude and perspectives towards VLEs

In a utopian society, the student's perspective of assessment and how much cognitive
learning takes places should be integrated with that of their instructors. For this study,
Bloom's taxonomy of learning was used to evaluate student's perception of their ability
to know, comprehend, apply, analyze, synthesize, and evaluate the course content.
From the results from the questionnaire, as seen in Fig. 2, 42% of students focused on
understanding the content and a further 32% on memorizing the facts. Rote memori-
zation does not promote critical thinking, more in-depth understanding, and knowledge
assimilation and transfer. Students who focus on comprehension of content rather than
memorization of facts will develop independent learning, problem-solving, and
solution-oriented approach to learning as an understanding of subject content is
crucial to experience deep learning.

In addition to adequate assessment procedures and active participation, students
better understand and apply material when problems and situations are based on real-
world issues and conditions (Smart and Cappel 2006). Authentic examples and sce-
narios provide the relevant stimulus for learning as they create higher student motiva-
tion and excitement for learning. By representing and simulating real-world problems
and contexts, learners are given the appropriate structures to encourage critical thinking
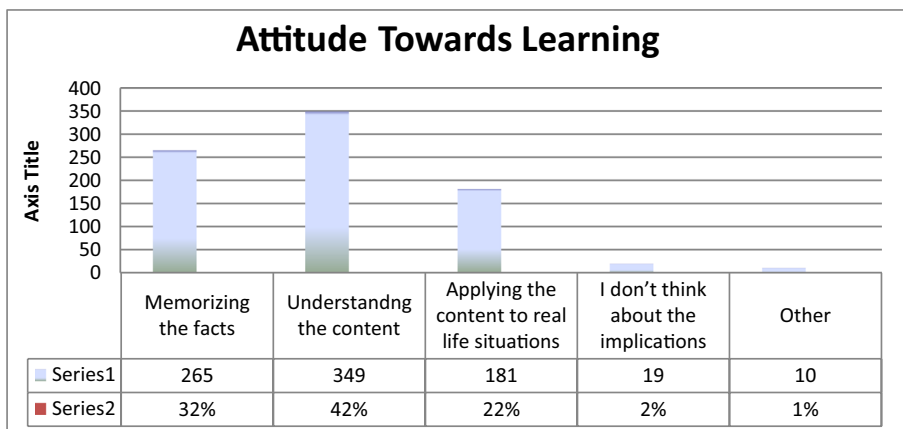

	Memorizing the facts	Understandng the content	Applying the content to real life situations	I don't think about the implications	Other
Series1	265	349	181	19	10
Series2	32%	42%	22%	2%	1%

Fig. 2 Attitude towards learning

skills and thereby experience deep learning. These real-life scenarios create a higher likelihood of learning as the emphasis is on the tasks in context rather than abstract or out-of-context activities (Driscoll and Carliner 2005). Hence, the instructors were very pointed in their approach:

> []...."Analytical problems ...were they cannot rely on the textbook ....but tear apart and see the underlying information". They need to develop relevant skills... they need to survive when they start working (Interviewee 3).

> ..."They are given real life case studies...based on current events and companies" (Interviewee 4).

> ...[] "I make use of opinion papers... cut and paste nothing as students can find everything online and will take the easy way out". (Interviewee 1)

> ....[]Students are forced to think and apply the knowledge through simulations (Interviewee 6)

Using case studies, opinion papers, simulations, and critical papers promote critical thinking, which involves active and skillful analysis, synthesis, and application of information to unique situations. Students learning retention and performance, improve as they are required to apply what they learned and then reflect upon the learning. Therefore, VLEs provide opportunities to promote reflective thinking and deep learning by integrating and using principles learned (Driscoll and Carliner 2005; Bransford et al. 2000). Providing students with meaningful examples assist learners in making meaningful connections with the course content and daily applications of knowledge.

The questionnaire reveals that 67% of students had a surface strategy to learning as they were passive in their approach to learning, as indicated by Fig. 3. Likewise, student perceives that when the workload or assessment demand of a subject is high,
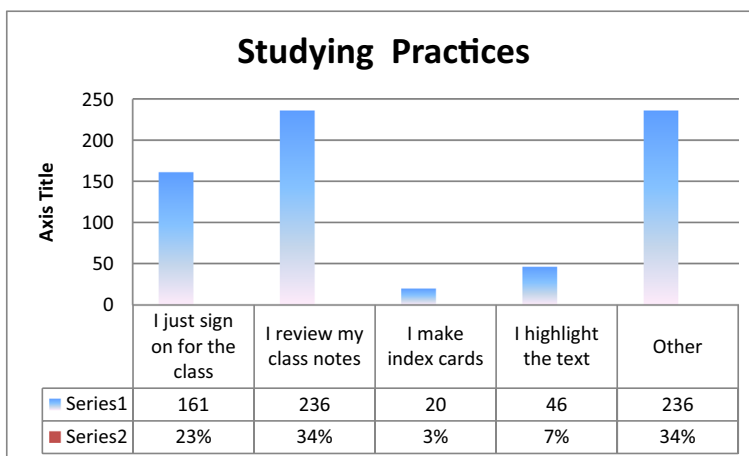
Studying Practices

	I just sign on for the class	I review my class notes	I make index cards	I highlight the text	Other
■ Series1	161	236	20	46	236
■ Series2	23%	34%	3%	7%	34%

Fig. 3 Methods of assessment

this encourages memorization and recollection of facts rather than the development of understanding.

The instructors also highlighted collaboration and group discussion as the primary tool for encouraging participation. Collaboration encourages learners to interact with each other and to share their own experiences and perspectives as they relate what they are learning. It helps students to develop meaningful interactions and dialogue. In these environments, instructors can focus on the quality of learning and therefore need to take an active role in encouraging dynamic interaction in the VLEs by posing questions which encourage elaboration and the further development of knowledge (Chapman et al. (2005). From the questionnaire, 66% of students were taught using Blackboard and a further 14% employed third party or publisher's content management system.

> *To foster collaboration and promote deep learning environment, …[]..students are asked to introduce themselves by telling their name, degree program and other interests*

Given the increased responsibility that students have for their learning and the changing role of instructors in the online environment, it is vital that students be both intrinsically and extrinsically motivated. Since one of the goals of this study is to examine the instructor's perception of achieving deep learning, the primary focus of this portion of the study is extrinsic motivation. A fact highlighted by Interviewee 3:

> …[] *"the material is so designed that students are free to express themselves in the discussion and show analytical thinking and skills"* (Interviewee 3).

> …[] *I try to make the content as relevant and engaging as possible* (Interviewee 1).

> …[] *the use of real-life examples and opinion papers keep them (students) interested in the topic. (*Interviewee 5)

However, since deep learning is also a result of intrinsic motivation (Ryan and Deci 2000) in the VLE, instructors cannot dominate the process. Instead, each learner should be held accountable for his/her learning outcome and any change in performance, whether an increase or decrease communicated to students. The results from the interviews confirm the significance of pedagogy in students experiencing deep learning. Thus, instructors, when designing and developing the content, must create an environment conducive to deep learning where explicit linkages and knowledge transference between courses must be made. Therefore, assignments that reinforce the content should be explicitly designed in such a way that students are forced to engage socially and cognitively with the material (Mahoney and Schamber 2011). According to Cercone (2008), students experience deep learning in online learning environments when there are interaction and collaboration between learners, linkage and application of new knowledge to experience, self-reflection, and self-regulated learning is promoted. From the discussion with instructors, there was evidence that these qualities were designed and developed in the learning environment, assessment strategy, and feedback provided to students. Students also were required to socially

interact with their peers, thus developing a sense of community. Social engagement, according to social constructivists of online learning (Angelino et al. 2007), refers to the ability of learners to interact with their peers in an online course socially. Both the questionnaire and interviews identified Blackboard (67%) as the primary learning management system.

8 Discussion of findings

Several instructional interventions can be included in an online learning environment which will facilitate deep learning. These include mentoring, scaffolding, and argumentative instruction. By allowing discussion which promotes critical thinking and actual writing, instructors were able to encourage deeper active learning; consequently, applications did not appear superficial and replicated rote memorization techniques. Since a surface approach to learning is often motivated by the student desire to invest minimum effort which allows for the reproduction of material without any analysis or integration, instructors keen to avoid assessment strategies which promote shallow thinking, reproduction or simple replication of information. Some students nevertheless were disinterested in the process as they were motivated by grades and passing rather than actual learning. This highlights a disconnect between the two instructors and learners in the expectations, attitude towards learning, and the learning environment.

In the design and development of a VLE, instructors should be purposeful and systematic in their approach to teaching with the intent focusing on quality and depth of knowledge. Rather than merely testing for facts and information, instructors should challenge student's progression of knowledge and understanding. Since students are motivated by a desire to achieve high grades assessment requirements, which are heavily moderated, will affect their study behavior. Consequently, students are motivated by the achievement of grades rather than by learning, growth, and discovery. Since interactivity and engagement are the hallmarks of deep learning in a VLE, instructors should design their virtual classroom to encourage learners to be intellectually and socially involved. By checking for regular interactions in the groups and monitoring the progress instructors can stimulate the development of higher level and more complex cognitive skills.

From the results, feedback to students was also considered essential for students experiencing deep learning. The premise behind formative assessment in VLEs is to provide students with the feedback they need to correct unfavorable learning behaviors and strengthen desirable behaviors. Hence the quality of the feedback provided by the instructor is essential is assisting with self-regulated learning, and self-evaluation thereby changing unfavorable behaviors which promote surface type learning. The nature of the decisions and feedback that instructors provide in the VLE helps determine how and what students learn and significantly impact student's engagement and commitment to deep learning. In addition to providing feedback, instructors are charged with the responsibility of developing content material that is relevant, interesting, challenging, profoundly conceptual, and collaborative. However, improving the educational experiences and outcomes for students requires a reversion in thinking about student engagement and a more profound understanding of how they affect learners. By moving away from procedural tasks and the memorization of facts to a

more conceptual and analytical form will assist with student's experience of active learning. Therefore, incorporating techniques such as case studies, group work learning, collaborative learning approaches, and specific tasks designed to address high-quality learning outcomes, such as analytical and conceptual thinking skills.

The discussion above shows that active learners take responsibility for their learning and are intrinsically motivated. Whatever the classroom environment, whether virtual or traditional, all students require deep intellectual engagement through which they can become active learners by exploring and investigating the learning material for a sustained period. As learning environments become less personalized, helping students to interact in the virtual classroom will help them to become adaptive, self-sufficient, resilient, and confident interacting with the content material and engaging with their colleagues.

Instructors, when designing and developing the VLE, should focus on developing guidelines to support quality learning through well-formulated objectives and creative assignments. Coursework can be broken down into different components which allow for scaffolding and feedback for improvement. Tasks which promote inquiry, critical thinking, the development of complex cognitive skills, change in perspectives, and connection among students and instructor should be assigned. Instructor's interaction with students should encourage thinking by posing thought-provoking questions, which lead to a deeper understanding of course topics. Being interactive and promoting collaboration through group work and providing students with multiple means of engagement, representation, and expression instructors can develop the type of learning environment which fosters nurture deep learning.

9 Conclusions

To promote deep learning among learners in a VLE can prove challenging, owing to factors such as student attitudes, perspective, interaction, technology instructors, amongst others. This study considered the role of the instructor in assisting students achieves deep learning in the VLEs which can be challenging just by their very nature as, in the VLE, the instructor must design the course in advance, and once started must remain visibly and actively involved in the learning process. Indeed, VLEs are unique environments as they require thoughtful care from the instructors to help students become engaged and stimulated in their learning process. Owing to the level of commitment and difficulty concerned it is relatively easy to induce a surface approach rather than a deep approach.

Students do not automatically experience deep learning in the VLE without the appropriate instructional supports from instructors. The instructor must stimulate deep thinking with a well-formed and probing questions or comments which promotes critical thinking and knowledge transference. In addition to the quality of the instruction, the instructor must accurately assess the students learning needs. Therefore, the instructor's role is crucial not only for supporting material but also for facilitating the learning process. Nonetheless, students should be encouraged to develop their learning strategies to adjust to these new learning environments. However deep learning should not be seen as an alternative to surface learning since the memorization of facts and knowledge is bad, the role of deep learning in the VLEs should be to build understanding and knowledge integration upon the facts that students already know.

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