Designing an online course to promote deep learning outcomes

B. Morgan
Western Oregon University
Monmouth, Oregon, United States

Abstract - Online courses are seen as a means to deliver an educational experience to a wider audience. Often it is believed that face to face courses can simply be put online, in a plug and go model, and that will be sufficient to deliver deep learning outcomes. This paper first considers the difference between surface and deep learning then seeks to provide a pedagogical paradigm that promotes deep learning. The Communities of Inquiry (CoI) model for online course delivery models this paradigm and supports the assertion that deep learning is an attainable objective, but is far more nuanced and requires far greater resources than the plug and go model suggests.

Keywords: e-learning, online education model, Communities of Inquiry, deep learning outcomes, collaborative learning

1 Introduction

As the tertiary educational system continues to work to minimize expenses, many institutions are turning to distance education as a solution to their financial shortfalls [1]. However, there are still concerns about current technologies and their ability to deliver an educational experience that promotes deep learning [2], [3]. Given the current research into a successful pedagogical paradigm, it can be shown that online courses can be effective in delivering a deep learning experience.

This paper begins by defining deep learning followed by applying this definition to the theoretical framework of Communities of Inquiry (CoI), a theory that has been shown to actively engage learners and assist in designing online courses. Finally, an outline of a course model is given.

2 Definition of Deep Learning

Deep learning is often defined along with its contrasting outcome, surface learning. Table 1 is used to demonstrate perceived differences in the two distinct types of learning. Based on this information deep learning can be defined as knowledge that has been assimilated into previous knowledge and is applied to everyday experiences and interdisciplinary concepts. Students demonstrate this knowledge when they can argue or defend ideas broadly and coherently using knowledge and theory from multiple disciplines. Critical thinking is considered a precursor to deep learning.

<table>
<thead>
<tr>
<th>Deep</th>
<th>Surface</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus is on “what is signified”</td>
<td>Focus is on the “signs” (or on the learning as a signifier of something else)</td>
</tr>
<tr>
<td>Relates previous knowledge to new knowledge</td>
<td>Focus on unrelated parts of the task</td>
</tr>
<tr>
<td>Relates knowledge from different courses</td>
<td>Information for assessment is simply memorized</td>
</tr>
<tr>
<td>Relates theoretical ideas to everyday experience</td>
<td>Facts and concepts are associated unreflectively</td>
</tr>
<tr>
<td>Relates and distinguishes evidence and argument</td>
<td>Principles are not distinguished from examples</td>
</tr>
<tr>
<td>Organizes and structures content into coherent whole</td>
<td>Task is treated as an external imposition</td>
</tr>
<tr>
<td>Emphasis is internal, from within the student</td>
<td>Emphasis is external, from demands of assessment</td>
</tr>
</tbody>
</table>

Table 1. Comparison of Deep and Surface Learning [4]

Deep and surface learning are not attributes of the learner; an individual can demonstrate either trait depending on the situation [4]. Research has shown that a “deep strategic approach to studying is generally related to high levels of academic achievement, but only where the assessment procedures emphasize and reward personal understanding” [5, p. 4]. This establishes the necessity to design courses to provide support for and reward critical thinking and a deep approach to learning. Those outcomes may be demonstrated using Bloom’s revised taxonomy [6] to operationalize deep learning by applying concepts 4.0 – 6.3 to student’s communication on forums and written assignments:

Structure of the Cognitive Process

Dimension of the Revised Taxonomy [6]

4.0 Analyze – Breaking material into its constituent parts and detecting how the parts relate to one another and to an overall structure or purpose.

4.1 Differentiating
4.2 Organizing
4.3 Attributing

5.0 Evaluate – Making judgments based on criteria and standards.

5.1 Checking
5.2 Critiquing

6.0 Create – Putting elements together to form a novel,
coherent whole or make an original product.

6.1 Generating
6.2 Planning
6.3 Producing

In the next section a theoretical framework that research indicates is supportive of deep learning, as defined in this section, is examined.

3 Theoretical Framework – Community of Inquiry (CoI)

Recognizing the need for social interaction in online, asynchronous courses, Garrison et al. [7] developed a schema designed to promote communication. The three elements of this structure are defined by Garrison et al.[7] and are considered to be “crucial prerequisites for a successful higher educational experience” (p. 87). These elements are social presence, cognitive presence, and teaching presence. Figure 1 is the model depicting the interaction between these three elements.

![Figure 1. Model of the CoI Framework](image)

Considering each of these elements separately allows reflection on their applicability to learning using computer-mediated communication.

3.1 Social presence

Learning theories support the premise that learning happens in community, through inquiry, and is socially constructed [8], [9], [10], [11]. Garrison et al.[7], who were inspired predominantly by the work of Dewey, used social construction of knowledge as the foundation for CoI, seeing social presence, guided by teaching presence, as support for cognitive presence. Social interaction historically has been seen as verbal interaction, however Garrison et al.[7] posited that, although oral communication is a rich medium, there are advantages to text based, asynchronous communication.

Nonverbal cues in face to face interactions were seen as necessary for more effective communication [12]. Without these nonverbal cues asynchronous, text-based communication was found to be more self-absorbed, and the relative status of participants largely unacknowledged compared to face to face communications [13]. Garrison et al. [7] asserted, however, that text-based, asynchronous communication had advantages over verbal communication and could assist in higher ordered learning objectives. They maintain, based on the work of Applebee [14], Fulwiler [15], and White [16], that verbal communication can be impulsive and fleeting. However, with text based communication, interchanges between people benefit from the ability to read and reread the issue being responded to and more time can be taken to form a response. Text based communication was seen to mediate the impulsivity sometimes associated with emotional outbursts [17].

Communication alone does not mean that deeper level learning is taking place. Social presence within the CoI framework is defined as “the ability of learners to project themselves socially and affectively into a community of inquiry” [18]. Although social presence has been shown to be based on student perception and is situational [19], the CoI framework provides the following indicators of social presence within an asynchronous communication medium: 1) emotional expression, 2) open communication, and 3) group cohesion [7].

As the CoI model shows, social presence is related to cognitive presence through discourse. Collaboration is essential for the construction of meaningful knowledge and cognitive development [7].

3.2 Cognitive presence

Cognitive presence is a product of communication and social presence that is facilitated to promote critical thinking [7]. The fact that students are interacting does not necessarily mean that they are interacting in ways that will promote the attainment of learning outcomes. Although social interaction as a quantitative measure can signal group cohesion, an important element of social presence, cognitive presence is reflected within the more qualitative measure of “purposeful and systematic discourse” [20]. Garrison et al. [7] developed the Practical Inquiry Model (PIM) to operationalize cognitive presence (Figure 2 on the next page).

Using the PIM to operationalize cognitive presence it can be seen that there is a correlation between cognitive presence and deep learning. Table 2 demonstrates cognitive presence through the lens of Bloom’s revised taxonomy to make the case for cognitive presence supporting deep learning.

The discussion of cognitive presence highlights the critical need for the third element, teaching presence. Teaching presence is essential to guide, focus, and structure social interaction to achieve cognitive presence, which is fundamental for deep and meaningful learning outcomes. In
fact research has shown that teaching presence is the most critical element of the CoI model [21], [20], [22], [23].

3.3 Teaching presence

The CoI model requires the interaction among all three elements as necessary for learning outcomes that are deep and meaningful. Research conducted on this model shows, however, that teaching presence is primarily responsible for the success or failure of outcomes [24], [25]. Garrison and Cleveland-Innes found that “teaching presence must be available, either from the facilitator or the other students, to transition from social to cognitive presence” [20, p. 143]. Additional research shows that it is important for teachers to model expected behaviors in order to create a community [26] and that high levels of interaction with instructors is significantly related to increased course satisfaction and perceived learning [27]. The teaching presence aspect of the CoI paradigm has three dimensions; design and organization, facilitating discourse, and direct instruction [7], [28].

The design and organization dimension of teaching presence includes selecting curriculum and technologies to be used, creating assignments and group activities with the technologies and medium in mind, creating a timeline for learning and communicating this information effectively with students and establishing “netiquette” explicitly and by modeling proper behavior [23], [29].

Facilitating discourse refers to the activities that promote community building and provide guidance and structure to keep discourse focused and productive. This process involves creating a safe space for sharing ideas, identifying and mediating areas of agreement and disagreement, providing encouragement to students, drawing in students who are showing a reluctance to participate and prompting discussion, maintaining a productive climate, and continually assessing the efficacy of the process and making adjusts where necessary [7], [23].

Finally, teaching presence contains the dimension of direct instruction. Within this aspect teachers are responsible for “presenting content and questions, focusing the discussion on specific issues, summarizing discussion, confirming understanding, diagnosing misperceptions, injecting knowledge from diverse sources, and responding to technical concerns” [23, p. 62].

4 COURSE MODEL

The theoretical framework outlined lays the foundation for the course paradigm detailed in Table 3.

<table>
<thead>
<tr>
<th>Bloom’s Structure of Cognitive Process</th>
<th>PIM Category</th>
<th>PIM Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triggering events</td>
<td>Recognizing the problem</td>
<td></td>
</tr>
<tr>
<td>Sense of puzzlement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analyze</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Differentiating organizing</td>
<td>Explorations</td>
<td>Information exchange</td>
</tr>
<tr>
<td>Organizing</td>
<td></td>
<td>Discussion of ambiguities</td>
</tr>
<tr>
<td>Attributing</td>
<td>Integration</td>
<td>Connecting ideas</td>
</tr>
<tr>
<td>Create</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generating Planning Producing</td>
<td>Resolution</td>
<td>Create solutions</td>
</tr>
<tr>
<td>Resolution</td>
<td></td>
<td>Vicariously apply new ideas</td>
</tr>
<tr>
<td>Evaluating</td>
<td>Checking</td>
<td>Critically assess solutions</td>
</tr>
<tr>
<td>Critiquing</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Correlating Bloom’s Structure of Cognitive Process and Practical Inquiry Model

<table>
<thead>
<tr>
<th>Teacher Role</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-course setup</strong></td>
</tr>
<tr>
<td>Creating Assignments:</td>
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</tbody>
</table>

Assignments should move through the revised Bloom’s taxonomy in order to facilitate deep learning. The first part of the assignment should be designed to analyze a problem – breaking it down into pieces and organizing the problem. The next step is to evaluate the possible solutions and the last step would be to put
the pieces together to form a unique perspective on or solution to the given problem. The assignments should be created to include team projects and class discussions, requiring both synchronous and asynchronous forms of communication.

Choosing technology:

1. **Synchronous communication** – There are many options in this realm, but research has shown that in a synchronous, text-based form of communication it is important to have a system that shows who is online. Skype is an example of a technology that allows for instant messaging, with online visibility, as well as group voice interaction. This technology is also important to facilitate virtual office hours.

2. **Asynchronous communication** – The possibilities in this area can be forums, blogs, or wikis. Each of these provides students a means of communicating in a more formal arena, giving time to put thought into the communication. In asynchronous communication using notification tools helps students to participate more fully as they are informed when someone has responded to their post or the teacher has given feedback.

3. **Learning Management Systems** - Research has shown that LMS that provide all of the information for each week in one place and are navigated with the least number of clicks are preferred by students. Also listed as advantageous were having profile pictures next to discussion posts, the ability to add emoticons to posts and the WYSIWYG editors that allowed the transfer of formatting into posts when cut and pasted from another document [30].

The first week should be devoted to downloading and becoming familiar with technology, self introductions and getting to know each other. This supports developing relationships between students, forming social presence.

<table>
<thead>
<tr>
<th>Direct Instruction</th>
<th>Teacher Role</th>
<th>Student Role</th>
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</thead>
<tbody>
<tr>
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<td>presenting content and questions,</td>
<td>Being responsible and respectful including:</td>
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<tr>
<td></td>
<td>focusing the discussion on specific issues,</td>
<td>• Completing individual work before the group meetings.</td>
</tr>
<tr>
<td></td>
<td>summarizing discussion,</td>
<td>• Continuing participation in asynchronous discussions.</td>
</tr>
<tr>
<td></td>
<td>confirming understanding,</td>
<td>• Being on time for meetings using synchronous methods.</td>
</tr>
<tr>
<td></td>
<td>diagnosing misperceptions,</td>
<td>• Being respectful of others/ following the rules of netiquette. For example:</td>
</tr>
<tr>
<td></td>
<td>injecting knowledge from diverse sources, and</td>
<td>o Re-read your comments before you post them.</td>
</tr>
<tr>
<td></td>
<td>responding to technical concerns</td>
<td>o Never make derogatory comments toward another person in the class.</td>
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<table>
<thead>
<tr>
<th>Social Presence</th>
<th>Activities that promote community building and providing guidance and structure to keep discourse focused and productive, including:</th>
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<tr>
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<td></td>
<td>[7], [23].</td>
<td>o Do not make sexist, racist, homophobic, or victim-blaming comments.</td>
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<tr>
<td></td>
<td></td>
<td>• If problems arise, using the instructor as a mediator.</td>
</tr>
</tbody>
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Direct Instruction:
- Presenting content and questions,
- Focusing the discussion on specific issues,
- Summarizing discussion,
- Confirming understanding,
- Diagnosing misperceptions,
- Injecting knowledge from diverse sources, and
- Responding to technical concerns [23].

Teacher Role:
- Activities that promote community building and providing guidance and structure to keep discourse focused and productive, including:
  - Creating a safe space for sharing ideas,
  - Identifying and mediating areas of agreement and disagreement,
  - Providing encouragement to students,
  - Drawing in students who are showing a reluctance to participate and prompting discussion,
  - Maintaining a productive climate, and
  - Continually assessing the efficacy of the process and making adjustments where necessary [7], [23].

Student Role:
- Being responsible and respectful including:
  - Completing individual work before the group meetings.
  - Continuing participation in asynchronous discussions.
  - Being on time for meetings using synchronous methods.
  - Being respectful of others/ following the rules of netiquette. For example:
    - Re-read your comments before you post them.
    - Never make derogatory comments toward another person in the class.
    - Do not make sexist, racist, homophobic, or victim-blaming comments.
    - Do not demean others.
    - Encourage others to develop and share their ideas.
  - If problems arise, using the instructor as a mediator.
Cognitive Presence

Within the PIM model:
- Provide a triggering event (e.g., an assignment or a question to focus discussion).
- Provide adequate time in the course framework for student reflection.
- Bring students back to the space of discourse, if needed provide scaffolding to assist in the integration of new ideas, and direct new discourse on the outcome of reflection.

As this is an iterative model assignments should contain prompts that can be given to promote further iteration to obtain deeper levels of learning.

Within the PIM model:
- Participate in the discussion and analysis with group members.
- Take significant time and opportunities to contemplate the presented issue, putting it together with other concepts already learned.
- Participate in the new discourse considering all new ideas each group member brings to the table. Share fully the ideas that came from individual reflection.

Table 3 – Course Model for teaching online

<table>
<thead>
<tr>
<th>Cognitive Presence</th>
<th>Within the PIM model:</th>
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</thead>
<tbody>
<tr>
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5 Conclusion

The issue concerning the possibility of engaging students online in a community of learners that promotes deep learning outcomes is a complex and multi-layered query. This paper provides support for the initial claim that deep learning in online course is possible. Additionally a model is outlined to facilitate the creation of online classes that provide the elements supported by the theoretical framework.

It should be noted that in order to create online environments that promote deep learning it must be taken into consideration that feedback from instructors is critical. This leads to the necessity for small classes. So the paradox exists that classes need to be larger to generate revenue, however they need to remain small to promote the elements that support deep learning. Teachers report that online classes require more preparation and more overall teaching time than face to face classes do [31].

In closing it is important to note that the CoI framework is dependent upon proper design and implementation. In order to promote critical thinking teachers must be prepared to guide and participate. The research shows that the ultimate success of an online course lies predominately with the instructor.

6 References