LEARNING STYLE AND CRITICAL THINKING IN AN ONLINE COURSE THAT USES CONCEPT MAPS

Simone Conceição, UWM School of Education

Abstract. As online courses become more prevalent in higher education programs, instructors begin to explore which teaching strategies are more effective to facilitate student learning based on different learning styles. One teaching strategy that is commonly employed in online courses is the use of discussion forums for the purpose of fostering learners' critical thinking skills. Using online discussion forums in courses, often some students lack effective strategies for participating in this activity. Therefore, this study proposed to explore the relationship between learning style and critical thinking in an online course that used discussion forums and concept maps as teaching strategies. The learning strategies used by students in the course were assessed using a Kolb-based learning style inventory. Students' critical thinking skills were assessed by having them create concept maps of the reading materials and discussions in the course. Results of this study indicate that there is no relationship between learning style and critical thinking; however, study findings suggest that individual and group factors influenced the ability for students to demonstrate successful critical thinking skills in the course.

1   Introduction

As online courses become more prevalent in higher education programs, instructors begin to explore which teaching strategies are more effective to facilitate student learning based on different learning styles. One teaching strategy that is commonly employed in online courses is the use of discussion forums for the purpose of fostering learners' critical thinking skills. In an online discussion forum, a group of learners engages in a computer-mediated interchange of ideas, using e-mail, chat, or bulletin board technology. As in a face-to-face discussion, each message is seen by all members of the group, but the lack of direct personal contact presents certain challenges. Using online discussion forums in courses, often some students lack effective strategies for participating in this activity. Therefore, this study proposed to explore the relationship between learning style and critical thinking in an online course that used discussion forums and concept maps as teaching strategies. The initial conjecture was that certain learning strategies would help learners be more successful in online discussion forums. To study this issue, an Internet-based course using online discussion forums with the purpose of fostering learners' critical thinking skills was investigated.

2   Online Course Activities

The Internet-based course was offered in fall 2003 and included three activities: online discussions, concept maps, and development of a program.

2.1   Online Discussions

For the online discussion forums, students were divided into groups of four. Students were required to post a minimum of five messages per discussion module. For each discussion module, two class members were assigned the roles of facilitator and summarizer. In addition, all group members played the role of contributor. The facilitator was responsible for initiating the discussion with one or two questions from the readings. As group members responded to the facilitator's questions, the facilitator extended the discussion by posing new questions on issues that came out of the discussion. Additionally, the facilitator was supposed to refer back to the readings to initiate discussion on another aspect of the topic. The facilitator was responsible for selecting discussion topics based on the readings, setting an agenda for the length of the discussion period, providing brief summaries during the discussion, initiating new topics, and keeping an active and involved discussion going throughout the specified module dates. The summarizer was responsible for providing a brief review of the main issues discussed, the key points that participants made in their group, and any conclusions reached by the group at the end of each module. Contributors were required to respond to questions posted by facilitators and group members, as well as review and comment on the responses of others through the discussion board.

One important aspect of the online discussion was that each response posted by participants had to clearly tie back to the reading materials. Participants could post comments in a variety of different formats: introduce scholarly references from other sources to support or highlight their perspectives, discuss personal experiences, or share professional experiences related to the module topic, but each response had to refer back to a point or points in the reading materials. Participants had to make their arguments, describe experiences, or discuss

alternative perspectives within the context of the reading materials. The grading of the online discussion activity was based on two aspects of the students' participation: role playing (facilitator, contributor, and summarizer) and critical thinking (demonstrate evidence of dynamic reorganization of knowledge in meaningful and usable ways).

2.2   Concept Maps

Concept maps were used as a teaching and evaluation tool in this study. As a teaching tool, concept maps allowed students to gain a set of skills to process and generate information and beliefs. As an evaluation tool, concept maps assisted students to self-assess their own thinking processes and were used in this study to evaluate the critical thinking skills of the students. Students created concept maps that depicted their understanding of the theories and concepts in the readings and online discussion forums upon completion of each module. In addition, at the end of the semester students created a concept map of their understanding of the concepts addressed in the course throughout the semester. Concept maps were graded based on the following criteria (Novak & Gowin, 1984):

> *Proposition:* Is the meaning relationship between two concepts indicated by the connecting line and linking word(s)? Is the relationship valid?
> *Hierarchy:* Does the map show hierarchy? Is each subordinate concept more specific and less general than the concept drawn above it (in the context of the material being mapped)?
> *Cross links:* Does the map show meaningful connections between one segment of the concept hierarchy and another segment? Is the relationship shown significant and valid?

As part of the concept map activity, students were asked to respond to the following questions:

- After creating the concept map, did you see relationships among concepts that you did not see before?
- What was the easiest relationship among concepts to depict? What were the most difficult relationships to depict? Why were they easy or hard to depict?
- Look at the concept map and think back to the online discussion you participated during this module. Is there a relationship between the concepts you read and the online discussion? Were there moments in the online discussion you felt disoriented or confused? Does the concept map provide any clues about why you felt this way?

2.3   Development of a Program

For this assignment students were divided into groups and they decided to maintain the same group they were working with in the online discussion forum. Based on the course readings, resources from the Internet, and personal experience, students worked collaboratively online throughout the semester to design an educational program. Students had to complete six tasks in order to meet the assignment requirements. These tasks were due every two weeks.

3   Methodology

The purpose of this investigation was to analyze the relationship between learning style and critical thinking in an online course that used discussion forums and concept maps as teaching strategies. Data were collected using quantitative and qualitative methods. The following data collection techniques were used: learning style inventory, records of participants' online discussions, concept maps, and self-reflections. A learning style indicator adapted from Kolb's (1984) learning style inventory was completed by learners in the beginning of the course to determine their learning style. Students participated in online discussion forums for a total of five course modules that lasted two to three weeks each. Students created concept maps of their understanding of the theories and concepts addressed in the readings and online discussion forums. In addition, students self-reflected on the concept maps immediately after they created them. Study participants included a total of eight students enrolled in a distance education course in fall semester 2003.

3.1   Research Questions

The study was based in the following research questions: Which learning styles are most likely to be successful in courses that use online discussion forums? Which students (based on learning style) are most likely to succeed in online discussion forums?

Data from online discussion forums, learning style inventory, concept maps, and concept map reflections were analyzed for the relationship between learning styles and learners' ability to demonstrate critical thinking in an online discussion forum. Records from online discussion forums were examined to verify if students demonstrated evidence of dynamic reorganization of knowledge in meaningful and usable ways. The learning style inventory analysis was used to place learners in the following categories: Thinkers, Doers, Feelers, and Watchers. Concept maps were quantitatively scored based on Novak and Gowin's (1984) scoring model. The records of the self-reflections were examined qualitatively in order to gain additional insights into the relationship between learning style and ability to demonstrate critical thinking in online discussion forums.

4 Findings

Course participants were divided into three groups based on the results from the learning style inventory administered at the start of the semester. The learning style inventory categorized learners as Thinker (N=1), Doers (N=6), and Watcher (N=1). Group A was formed with four Doers; Group B was formed with two Doers, one Watcher, and one Thinker. The scores seen among students in each group were analyzed statistically to identify patterns of achievement in the course (Table 1 shows concept map scores). The first number in parenthesis corresponds to the proposition score, second number hierarchy score, and third number cross links score. The number in bold is the total of the three scores.

Student	CMap 1	CMap 2	CMap 3	CMap 4	CMap 5	Final CMap
Doer1 (A)	(16+10+0) **26**	(26+35+40) **101**	(32+10+80) **122**	(21+10+60) **91**	(26+15+10) **51**	(51+15+100) **166**
Doer2 (A)	(56+20+30) **106**	(64+25+70) **139**	(75+15+50) **140**	(60+30+50) **140**	(53+20+130) **203**	(70+20+130) **220**
Doer3 (A)	(88+20+250) **77**	(116+15+170) **311**	(17+20+40) **358**	(71+15+70) **156**	(29+10+40) **79**	(42+25+90) **157**
Doer4 (A)	(74+15+170) **259**	(88+25+410) **523**	(55+35+90) **180**	(42+20+80) **142**	(64+20+110) **194**	(105+25+280) **410**
Doer5 (B)	(67+15+90) **172**	(73+15+130) **218**	(75+10+110) **195**	(113+20+90) **223**	(66+15+70) **151**	(123+15+130) **288**
Thinker (B)	(87+15+300) **392**	(68+10+40) **118**	(66+20+140) **226**	(70+20+100) **190**	(45+25+40) **105**	(78+20+220) **318**
Watcher (B)	(43+20+170) **233**	(56+20+190) **266**	46+15+80) **141**	(51+15+90) **156**	(68+20+340) **428**	(113+20+220) **353**
Doer6 (B)	(31+20+80) **131**	(49+15+70) **134**	(35+20+60) **105**	(42+15+120) **177**	(23+15+80) **118**	(44+30+200) **274**
Average	174.5	226.5	183.75	159.38	166.13	273.25

Table 1: Concept Map Scores

Based on the analysis of the concept map scores, there is no relationship between learning style and critical thinking. Concept map scores were not constant based on students of a specific learning style. The scores also varied from module to module. These findings suggest that individual and group factors influenced the ability for students to demonstrate successful critical thinking in online discussion forums.

4.1.1 Individual Factors

Individual factors included: (1) learner's competency using concept map software, (2) learner's motivation about topics discussed in the group online discussions, and (3) individual learning style. According to learners' self-reflections, individuals who did not know how to use the concept map software constructed a very basic graphic representation of the relationship among concepts in the readings and online discussions. Learners stated that concept maps flowed naturally when the subject included relationships easy to break down into manageable topics, when topics were taken from personal experience, and topics that were more interesting in online discussions were easier to depict in the concept maps. Learners stated that difficult relationships among concepts to depict were the ones that understanding the theories and breaking them down was a complex task, interrelating a chapter with other chapters was not easy to do, and when the topic was least interesting. Individual learning styles affected how learners participated in the discussion. Doers were more inclined to provide examples from concrete experience and active experimentation and did not provide an in-depth analysis of topics during the online discussions. The Thinker tended to provide in-depth reflection of topics during the online discussions, but felt overwhelmed and confused at times. The Thinker stated that after completing the concept map, the concept map provided big clues for the confusion when discussing theories during the online

discussions. The Watcher provided a mix of reflective observation and concrete experience, a nice balance during the discussion and creation of concept maps.

4.1.2 Group Factors

Group factors consisted of (1) a combination of students' learning styles in a group and (2) group facilitation. Group A was formed with Doers and Group B had a mix of learning styles. Group A based most of the online discussions on concrete experiences and active experimentation. For the group project, Group A was on task by setting timelines and dividing roles; however, for the online discussions Group A participants were brief addressing the issues and lacked in-depth critical analysis of topics. For Group B, the online discussions involved reflection and analysis of concepts based on concrete experience and reflective observation. Though for the group project it was not until after several weeks of discussion that they figured out what and how to accomplish the group assignment. Another factor that influenced effective critical thinking in online discussion was group facilitation. For each module, one participant was the facilitator. If this student did not involve group members in the online discussions or did not provide enough questions in a timely manner, some students felt disappointed. But when the facilitator provided good directions to the group, it became easier for participants to create a framework for building their own concept maps.

5 Implications

This study sample was small, but it was contingent to the number of students enrolled in the course. The study will be repeated in fall semester 2004. The preliminary findings suggest that understanding how learning styles affect learners' success in online discussion forums can assist instructors in providing better guidelines to learners when designing online courses. At the beginning of a course, learners can be told which learning strategies are most effective when participating in online discussion forums. This can be particularly helpful for learners whose personal learning style does not emphasize those strategies. One valuable lesson that this study offers is that a mix of learning styles in a group can make the learning experience more balanced. Thus, instructors should consider combining students with different learning styles when setting up groups in the beginning of a course.

References

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