

## Investigating the Extent of Critical Thinking in Field-Dependent and Field-Independent Students' Blog Posts

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### Abstract

Identifying critical thinking and learners' characteristics is very important in an online learning environment. This study investigated the extent of critical thinking between field-dependent and field-independent students' critical thinking and blogging. It is a quasi-experimental in which a quantitative method was employed on an intact class of the students to develop their CT skills in their argumentative blog posts. Different aspects of CT skills, such as observation, inference, reasoning, assumption, and credibility were explained to the students. The GEFT developed by Witkin et al. (1971) was applied to evaluate the students' field dependency. Moreover, Newman et al. model (1996) was applied to analyze students' CT in their blog posts. No significant difference was found in the number of positive and negative CT indicators used by FD and FI students. Therefore, educators who wish to improve the students' learning may train the students in CT skills by using a pre-planned and systematic procedure without worrying about learners' cognitive styles, particularly their field dependency.

**Keywords:** blogging; critical thinking; cognitive style; field dependency

### Introduction

Generally, students need to improve their writing to do various activities (Teng, Wang, & Zhang, 2022), such as passing proficiency tests, answering exam questions, working on their

theses, and writing academic papers (Shahsavar & Kourepaz, 2020). To write effectively, students need to promote their critical thinking (CT) to compose, develop, and analyze their ideas. They do not only need to use clarity, stability, diversity, and logic as major elements in their writing but also have to link new ideas with familiar ones, synthesize knowledge, explore relations and implications, outline information, strengthen conceptual frameworks, and consider others' point of view in their writing (Tahira & Haider, 2019).

Many studies point out a need for using effective learning strategies to promote

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students' CT in a face-to-face learning environment (Hatcher, 2006) ; (Tahira & Haider, 2019). However, limited contact time is the main problem for students to clearly understand CT skills and use them in a face-to-face learning environment. In a word, it could be argued that in face-to-face classes, instructors cannot provide sufficient time to conduct various CT strategies that require them to analyze problems, compare substitute treatments, give logical reasons, and critically predict results (Wittrock, 2010).

Hence, to maximize the impact of CT skill training and expand instruction opportunities outside the limitations of face-to-face class time, different studies try to bring light into using an online learning environment. However, the main disadvantage of an online learning environment is the lack of face-to-face interactions between the students and the instructors which limit the success of giving precise guidance to the students on using CT skills effectively (Pena & Almaguer, 2012).

To this end, the use of Web 2.0 tools such as Wikis, discussion forums, and blogs can develop college students' writing and also promote their CT. Among these Web tools, blogs have been used widely in education. Despite traditional classrooms, which follow a fixed learning process for learners, blogs can create an interactive environment for students to authentic uses of the target language, which can inspire and challenge the students to think in ways that traditional classroom experiences cannot (Sharma & Tietjen, 2016). In this view, students' writing is no longer limited to receiving instructors' feedback. In contrast, blogging gives an excellent opportunity for students to interact with each other and their instructors whenever

they have time or inclination. Also, the students break the barriers of face-to-face classrooms such as limited time (Pieschl & Sivyler, 2021).

Beyond the importance of online learning, researchers also emphasize that instructors should pay close attention to learners' cognitive styles such as field dependency in acquiring and processing information and responding to learning. Without understanding learners' cognitive styles, learning performance will likely be limited (Evedi et al., 2022; Kafipour & Noordin, 2021).

Despite the importance of identifying learners' characteristics in a learning environment, literature continues to suffer from a lack of research about how field-dependent (FD) and field-independent (FI) students can apply CT skills in an online learning environment, particularly in blogging. In this study, the specific objective is to investigate the extent of CT in FD and FI students' blog posts.

### **Blogging and Critical thinking**

Among Web 2.0 tools, the rapid development of blogs in education is considerable (Clark & Paulsen, 2016). Blogs have changed the classroom environment and caused significant changes in education (Zhao & Frank, 2003). Compared to other Web 2.0 tools like Facebook, wikis, and podcasts, blogs facilitate individualized teaching and learning styles in a variety of settings and give an equal chance to all students, especially those who are reluctant to participate in different class activities (Pieschl & Sivyler, 2021). Blogs create interactivity in a learning environment, giving students an excellent opportunity to interact with other students and their teachers anywhere and anytime. Interactivity refers to

prolonged, two-way communication between peers and an instructor to complete a task or maintain a social relationship. Blog interactions expose learners to the authentic uses of the language in inspiring and challenging ways that learners cannot experience in a face-to-face classroom (Wang, Woo, & Zhao, 2009) since blogging is a new method of writing related to editing on blogs. It gives the students a chance to reflect on their own and others' writing, allowing them to create, publish, and share their thoughts (Gooding & Morris, 2008). These activities force the students to think more analytically and critically, which may also promote their CT and writing skills (Richardson, 2004).

Mayfield (2007) explained some main aspects of CT such as observation, inference, reasoning, assumption, and credibility. By definition, observation is "a process of sensing, perceiving, and thinking" (p.38). In cultivating observation, first, we collect data through the sense organ. Second, we hold data in consciousness to perceive and categorize or interpret it. Finally, we organize our perception through thinking. To this end, careful observation helps critical thinkers see details to solve problems or arrive at insight and gain new knowledge.

According to Mohanan (2003), critical thinkers require reasoning to arrive at "conclusions, judgment, or inferences from the fact or premises" in their writing (p. 352). There are two basic kinds of reasoning: inductive and deductive. Inductive reasoning involves trying to create general principles by starting with many examples that take events and make generalizations. In contrast to this, deductive reasoning arrives at a particular conclusion

based on generalizations. In other words, inductive reasoning goes from the particular to the general. In contrast, deductive reasoning goes from general to particular. However, both deductive and inductive reasoning can occur in arguments frequently and naturally; both forms can be equally compelling and persuasive, and neither form is preferred over the other.

Assumptions are when we take something for granted or accept it as true without proof. They can be dissected into warranted or unwarranted (Kies, 2010). Warranted assumptions may have supportive evidence in contrast to unwarranted ones. For example, if a friend invites us over to his/her house for lunch, we can assume that we will not pay for a meal; however, if we go to a restaurant together, it would be unwarranted to expect a meal for free (Maghsudi, 2007). Another important aspect of CT is credibility which shows the quality of being believable or trustworthy. Judgments about credibility depend on "judgments about whether, and to what extent, to believe someone else's assertion" (Ennis, Millman, & Tomoko, 2004).

Although careful observation is vital to writing an argument, it is insufficient. Good critical thinkers should use inferences to their imaginations, reasons, guesses, speculations, estimations, predictions, and conceptions. Accordingly, when critical thinkers infer, they take guesses to bridge between what they know and what they do not know. They also bring their imagination or reasoning to explain the situation in which the facts are neither available nor determined (Paul & Elder, 2007)

Research shows that sharing information and discussing it on blogs can enhance students' writing skills and CT abilities (Lai &

Wang, 2008). Students will become more independent, responsible, and careful when they know their posts will be read by others. In this case, blogging allows students to think more to analyze their writing. In addition, it boosts learners' self-confidence as their posts are seen and used by many simultaneously. One study reports 20 undergraduate students' participation in a course blog, in which most students agreed that blogs could serve as a medium to improve their writing. They believe blogs can deepen students' understanding of topics, promoting their ideas and writing (Zeng, & Harris, 2005).

According to Wang and Woo (2010), using a blog can enhance students' CT. From this perspective, four classes of secondary school students participated in a course blog. Four different interaction strategies were applied in each class: interaction with peers, interaction in groups of four, no interaction with others, and interaction with the teacher. The results indicate that the most effective way to promote students' CT was interaction with peers (the whole class). In contrast, the least effective one was the interaction in the group with fixed members. Besides, having no interaction was better than interacting with fixed groups but still less effective than interacting with the teacher.

### **Field Dependency and Online Learning**

Due to the prevalence of Web 2.0 tools in recent years, there is a need to investigate students' cognitive styles about using the tools in an online learning environment (Kafipour & Noordin, 2021). Although some studies emphasize students' cognitive styles in an online learning environment (Bocchi, Eastman, & Swift, 2004; Onyekuru, 2015; Verawati,

Hikmawati, & Prayogi, 2020), to the best of their knowledge, a few studies compared learners with particular field dependency in an online learning environment (Kafipour & Noordin, 2021; Shahsavari & Tan, 2011).

According to Onyekuru (2015), field dependency refers to how people perceive and memorize information. Therefore, FD and FI students are not considered as two different types of people but rather individuals who prefer particular learning characteristics which are almost stable over time. For example, FD students have a global perception which enables them to perceive objects as a whole and solve cognitive problems globally. They learn better in an informal environment relying on more external references, and prefer guided navigation (Chen & Macredie, 2002). They prefer situations where learning is analyzed and structured for them. They pay more attention to social cues and are better at getting along with others. They do not only tend to be more sociable, insistent, and perceptive of others' feelings and thoughts (Brown, 2007) but also can easily recall social information like conversation and relationships (Altun & Cakan, 2006) while FI students are superior to FD students in learning; they tend to be more autonomous, competitive, self-reliance, self-confident, and inner-directed. They are more sensible in learning, relying on internal references, and better at solving cognitive problems analytically than FD students (Chen & Macredie, 2002; Witkin & Goodenough, 1981).

Some studies claim that FI students perform better than FD students in an online learning environment. However, the former like non-linear programs that allow them to explore prompts related to their interest. In contrast,

FD students are interested in following linear programs that allow them to follow the planned learning process in an online learning environment. Therefore, as online learning methods are self-guided, FI students tend to be more successful in seeking and organizing information in this learning environment than FD students who follow indirect instruction (Chen, 2010; Chen & Macredie, 2002). This idea is in line with the perspective that FD students cannot adjust to an online learning environment as well as FI students (Chen & Macredie, 2002; Oh & Lim, 2005). Accordingly, FD students are not likely to succeed in distinguishing and reproducing information, distinguishing important clues, and organizing information in an online environment as FI students are. Furthermore, it is mentioned that FI students are better than FD students in online courses because they are more successful in setting their learning path (Chen, 2010). However, another study carried out by Swan (2004) at Florida University shows that most students who dropped out of online classes were FD students who needed others' approval in setting their learning path more than FI students who could control their learning.

### **Field Dependency and Writing Skill**

Field dependency has been reported as one of the main factors affecting students' language skills, such as writing (Nilforooshan & Afghari, 2007). Some researchers believe that FI students are better than FD students in some writing tasks, such as filling an initial outline and brainstorming to generate writing ideas before writing any drafts. However, they seem to have more difficulty in evaluating content (Town, 2003).

Another study by Nilforooshan and Afghari (2007) sought to determine the effect of EFL students' field dependency on students' writing in a face-to-face environment. In this study, the subjects were 89 undergraduate students enrolled in a writing course. The students were required to write narrative and argumentative essays. The ESL Holistic Scoring Guide (Petersburg Junior College, 1999) and the GEFT were applied to assess students' writing and field dependency, respectively. The findings show that FI students performed better than FD students in narrative writing. Although no significant difference was shown between FD students and FI students in their argumentative writing, FI students performed better in using reasoning, processing information, and restructuring ability in their writing than FD students.

As noted above, research on the impact of field dependency on students' writing skills is important (Town, 2003); however, there is a lack of research in this area. Therefore, the main objective of this study is to investigate the extent of CT in FD and FI students' blog posts. The research question is as follows: Is there a significant difference in the extent of CT in FD and FI students' blog posts after they were trained in CT skills?

### **Method**

This study is quasi-experimental in which a quantitative method was employed on an intact class of the students to develop CT skills in argumentative writing. The respondents were tertiary-level students enrolled in intact classes. They were 40 tertiary-level students aged between 20 and 25. They were from four ethnic origins: Malay, Chinese, Indian, and

Iranian. All of them spoke English as a second language. All students had personal computers, and most of them had home or student dormitory Internet access. They use at least one of the Web 2.0 tools, such as Facebook, email, wiki, and blog, every day. A few students were unfamiliar with blogs and had not used blogs at all. Others used blogs for different purposes, mainly personal and educational. The researcher at <http://www.blogger.com> set up the blog because it was free and the speed was reasonable. The students were told that the course blog participation was a compulsory assignment consisting of face-to-face and online sessions. All students filled out the consent form before taking part in this research.

The face-to-face sessions were conducted in a computer lab for one hour a week. Toward the end of the semester, the students participated in face-to-face sessions twice a week. In-between face-to-face sessions, they took part in online sessions on the blog individually. During the first face-to-face session, before the data collection process began, the students were briefed on the purpose of the course blog. Since a few students did not have any experience in blogging, they were given some hands-on practice on basic blogging skills such as posting and leaving comments.

After ensuring that all students could use different blogging strategies effectively, the researcher started CT skill training in which different aspects of CT skills, such as observation, inference, reasoning, assumption, and credibility, were explained in face-to-face sessions. To do so, first, the researcher introduced each CT skill to the students. After

that, the students were asked to give examples of each skill. They were also asked to solve some CT puzzles related to each CT skill. Finally, to ensure that the students were taught each CT skill, they were assigned to answer a set of CT exercises on each CT skill. The researchers created all CT exercises after a comprehensive review of CT exercises. Moreover, to ensure that CT exercises were evaluated, five experts on CT skills reviewed the exercises. All experts had experience teaching CT skills to tertiary-level students for 3 to 11 years.

#### **Instrument: Group Embedded Figure Test (GEFT)**

In this study, the GEFT developed by Witkin, Oltman, Raskin, & Krap (1971) was applied to evaluate students' field dependency. It consists of 25 items in three sections. The first section has seven questions, while the second and the third sections have nine questions each. Section one is used for practicing; hence, hence, the total score is based on the number of simple figures correctly chosen in the test's second and third sections of the test., Each section has a time limit of two, five, and five minutes to complete the test, respectively. During the allocated time, respondents are supposed to trace the simple figure embedded in the complex one. The score a test taker can get is 18-0. The cut-off point for the determination of field dependency is 11.4. Those who get higher than 11.4 are identified as FI students, and those who get lower than 11.4 are identified as FD students (Witkin et al., 1971).

In this study, the GEFT was deemed suitable for assessing students' field dependency for several important reasons. Firstly, using the GEFT as a group-administered test is more convenient than applying an individual-

administered test in an intact class. Secondly, it has been used in many studies, including Altun and Chakan (2006), Maghsudi (2007), Yamini and Rahnama (2008), and Kafipour and Noordin (2021). Thirdly, it has strong validity and reliability (Altun & Cakan, 2006; Witkin et al., 1971; Yamini & Rahnama, 2008). Fourthly, as a nonverbal test, it requires minimum language proficiency for carrying out the task (Cakan, 2003) and is, therefore, better suited for the present study respondents who learned English as a second language. Fifthly, its psychometrical properties are practical and sensible for cross-cultural settings such as the context of the present study with respondents from different cultural backgrounds (Altun & Cakan, 2006). Sixthly, it requires only about 20 minutes to complete the test. Lastly, it is measurable and quantifiable (Witkin et al., 1971).

Another instrument applied in this study was Newman et al. model (1996) to analyze students' CT in their blog posts. This model contains a list of comprehensive indicators using 40 codes, which show the characteristics of CT in 10 different categories: relevance, importance, novelty, bringing outside knowledge, ambiguities, linking ideas, justification, critical assessment, practical utility, and width of understanding. The unit of analysis for students' blog posts was "a phrase, a sentence, a paragraph, or a message" that matched the CT indicator of the Newman et al. model (Yang, Newby, & Bill, 2005). In this study, two raters, including the researcher, evaluated students' blog posts to overcome subjectivity and biases in the application and interpretation of CT codes and to reach a consensus on all codes. Both raters had experience in coding transcripts and knowledge of CT. With the same

coding decisions in coding the same content (Rourke, Anderson, Garrison, & Archer, 2001), an inter-rater coding procedure was applied, and an inter-rater coding check was conducted (Chi, 1997). It means that two raters separately evaluated the students' blog posts. If they did not use the same code, they discussed the discrepancies in the coding results and tried to reach an agreement through discussion. Moreover, to determine inter-rater reliability, Cohen's kappa coefficient was applied by using SPSS. For coding blog posts, the result of Cohen's Kappa was .87, which showed a high level of agreement between the two raters (Chi, 1997).

## Findings and Discussion

### Results

#### **Is there a significant difference in the extent of CT in FD and FI students' argumentative blog posts after they were trained in CT skills?**

In this study, 40 students participated, but four did not show up to take the GEFT on the test day; hence, the number of respondents for the analysis was 20 FD and 16 FI students. As shown in Table 1, the total number of units of analysis coded in FD students' first round of argumentative blog posts was 424 consisting of 201 (47%) positive and 223 (53%) negative codes. On average, each FD student posted 10.05 positive CT statements (201 units/ 20 students). The depth of the CT ratios for the indicators was as follows: R (18%), I (-14%), N (-31%), O (11%), A (-3%), L (-7%), J (-14%), and C (-19%) while the total number of units of analysis coded in FI students' first round of blog posts was 318 consisting of 136 (43%) positive

and 182 (57%) negative codes. On average, each FI student posted 8.5 positive CT statements (136 units/ 16 students), and the depth of the CT ratios for indicators was as follows: R (10%), I (-21%), N (-39%), O (-23%), A (-8%), L (-29%), J (6%), and C (-28%) (see Table 2). The statistical result did not show a significant difference in the number of positive and negative CT indicators used by FD and FI students in their argumentative blog posts. The result of the chi-square test affirms this claim  $\chi^2(1, N = 742) = 1.58, p = .21$ .

In the second round of argumentative blog posts that occurred at the beginning of CT skill

training, where students were trained in multiple aspects of CT skills, the total number of units of analysis coded in FD students' blog posts was 371 consisting of 196 (53%) positive, and 175 (47%) negative codes. On average, each FD student posted 9.8 positive CT statements (196 units/ 20 students). The depth of the CT ratios for the indicators was R (20%), I (-12%), N (0%), O (18%), A (11%), L (-2%), J (19%), and C (-7%) (see Table 1) and the total number of units of analysis coded in FI students' blog posts was 388 consisting of 220 (57%) positive, and 168 (43%) negative codes.

**Table 1**  
Depth of CT in FD students' argumentative blog posts

CT Indicator	Blog posts 1		Blog posts 2		Blog Posts 3		Blog posts 4	
	# of code	CT Ratio %	# of code	CT Ratio %	# of code	CT Ratio %	# of code	CT Ratio %
Relevance		18		20		63		58
R+	46		27		58		60	
R-	32		18		13		5	
Importance		-14		-12		64		61
I+	27		22		54		54	
I-	36		28		12		13	
Novelty		-31		0		54		70
N+	9		13		47		63	
N-	17		13		14		11	
Outside Knowledge		11		18		51		90
O+	20		36		58		60	
O-	16		25		19		3	
Ambiguities		-3		11		34		86
A+	33		30		47		54	
A-	35		24		23		4	
Linking ideas		-7		-2		28		45
L+	21		21		30		21	
L-	24		22		17		8	
Justification		-14		19		74		96
J+	21		19		40		50	
J-	28		13		6		1	
Critical assessment		-19		-7		27		78
C+	24		28		66		65	
C-	35		32		38		8	
Total+	201		196		400		427	
Total-	223		175		142		53	
Total	424		371		542		480	



On average, each student posted 13.75 positive CT statements (220 units/ 16 students). The depth of the CT ratios for the indicators was R (18%), I (-7%), N (19%), O (21%), A (41%), L (-16%), J (-27%), and C (27%) (see Table 2). No significant difference was found between FD and FI students in using positive and negative CT indicators in their argumentative blog posts. This claim is verified by the result of the Chi-square test  $\chi^2(1, N = 759) = 1.15, p = .28$ .

In the third round of argumentative blog posts in which the students were at the end of CT skill training, the total number of units of

analysis coded in FD students' blog posts was 542 consisting of 400 (74%) positive and 142 (26%) negative codes. On average, each student posted 20 positive CT statements (400 units/ 20 students). The depth of the CT ratios for indicators was as follows: R (63%), I (64%), N (54%), O (51%), A (34%), L (28%), J (74%), and C (27%) (see Table 1). A comparison of the depth of the CT ratios between FD and FI students' blog posts indicates that the total units of analysis coded in FI students' blog posts were less than in FD students' posts (see Table 2).

**Table 2**  
Depth of CT in FI students' argumentative blog posts

CT indicator	Blog posts 1		Blog posts 2		Blog posts 3		Blog posts 4	
	# of code	CT Ratio %	# of code	CT Ratio %	# of code	CT Ratio %	# of code	CT Ratio
Relevance		10		18		79		91
R+	28		39		42		61	
R-	23		27		5		3	
Importance		-21		-7		63		75
I+	19		27		40		56	
I-	29		31		9		8	
Novelty		-39		19		63		73
N+	11		16		49		64	
N-	25		11		11		10	
Outside Knowledge		-23		21		58		97
O+	12		38		42		61	
O-	19		25		11		1	
Ambiguities		-8		41		46		84
A+	24		41		30		47	
A-	28		17		11		4	
Linking ideas		-29		-16		22		84
L+	6		13		25		35	
L-	11		18		16		3	
Justification		6		-27		54		97
J+	19		11		47		57	
J-	17		19		14		1	
Critical assessment		-28		27		37		83
C+	17		35		54		73	
C-	30		20		25		7	
Total+	136		220		329		454	
Total-	182		168		102		37	
Total	318		388		431		491	

As shown in Table 2, the total number of units of analysis coded in FI students' blog posts was 431 consisting of 329 (76%) positive and

102 (24%) negative codes. On average, each FI student posted 20.56 positive CT statements (329 units/16 students). The depth of the CT

ratios for indicators was as follows: R (79%), I (63%), N (63%), O (58%), A (46%), L (22%), J (54%), and C (37%). Similar to the first two rounds of argumentative blog posts, no significant difference was found in the number of positive and negative CT indicators used by FD and FI students in their third round of argumentative blog posts. The result of the Chi-square test affirms this claim  $\chi^2(1, N = 973) = .82, p = .37$ .

In the fourth round of argumentative blog posts after the students were trained in SQ, the total number of units of analysis coded in FD students' blog posts was 480 consisting of 427 (89%) positive and 53 (11%) negative codes. On average, each student posted 21.35 positive CT statements (427 units/ 20 students). The depth of the CT ratios for indicators was as follows: R (58%), I (61%), N (70%), O (90%), A (86%), L (45%), J (96%), and C (78%) (see Table 1). In FI students' blog posts, the total number of units of analysis codes was 491 consisting of 454 (92%) positive and 37 (8%) negative codes. On average, each student posted 28.37 positive CT statements (454 units/ 16 students). The depth of the CT ratios for indicators was as follows: R (91%), I (75%), N (73%), O (97%), A (84%), L (84%), J (97%), and C (83%) (see Table 2).

Although FI students used more positive indicators in their fourth round of argumentative blog posts, no significant difference was found in the number of positive and negative CT indicators used by FD and FI students. This claim was affirmed by the result of the Chi-square test  $\chi^2(1, N = 971) = 3.55, p = .06$ .

## Discussion

Comparing the extent of CT in all blog posts, we found no significant difference in the

number of positive and negative CT indicators used by FD and FI students. The result supports Haunt, Meyer, & Lippert's (2006) idea that instructors should design argumentative writing skills to improve both FD and FI students' writing skills. In addition, the students' variation in field dependency does not give an advantage to learners to improve the extent of CT in their writing. The result is in line with some studies that since field dependency refers to individual learner characteristics, FD and FI students do not differ in their learning abilities (Altun & Cakan, 2006; Cakan, 2003; Heesacker, Petty, & Cacioppo, 1983). The result also supports the notion that learners' field dependency cannot be trained and are almost stable over time (Witkin et al., 1971) (Farsi, Bagheri, Sharif, & Nematollahi, 2014).

The result does not agree with Nilforooshan and Afghari's (2007) result that FI students performed better than FD students in reasoning, processing information, and writing. Also, it does not advocate the findings of other studies (e.g., Town 2003) that FI students are better than FD students in writing. Nevertheless, these findings have important implications that CT skills are not innate behavior. They can be taught and improved over time (Dekker, 2020).

## Conclusion

Training CT skills can enhance both FD and FI students' blog posts. Although the importance of CT is seen in this research, the challenge for the instructors is how to engage FD and FI students successfully to learn experiences that utilize CT skills. There is no doubt that students cannot achieve CT spontaneously; both FD and FI students need frequent practice, ill-

structured problems, and pleasant situations to recall appropriate knowledge rapidly, recognize relevant information, think ahead, and predict outcomes to promote their CT.

Lastly, CT is an essential skill for both FD and FI students. Therefore, educators who wish to improve the students' learning can train CT skills to the students by using a pre-planned and systematic procedure without having to worry about learners' cognitive styles, particularly their field dependency.

The first limitation pertaining to the study's design is the selection of an intact class of tertiary-level students. The result might be different if the researchers could minimize the issue of respondent bias by choosing a random sample. The second limitation is that even if the researchers had easy access to undergraduate students, some practical problems limited the desirability of a large sample because the computer lab had approximately 40 seats for the students to participate in the course blog activities. The third limitation arises from time constraints. In this study, one semester allowed the researcher to train CT skills and conduct the related tests only over four months. The fourth limitation indicates that the GEFT was applied to classify students into FD and FI students. It means that those who scored lower than 11.4 were considered FD students, while those who scored more than 11.4 were considered FI students (Witkin et al., 1971). The result could be different if the GEFT were used to classify students into three groups: FD students, FI students, and field intermediate (FI<sub>int</sub>), who might show the characteristics of both FD students and FI students. It means that those whose scores were equal or less than  $\frac{1}{4}$  standard deviation were considered FD

students; those whose scores were equal or more than  $\frac{1}{4}$  standard deviation were considered FI students, and students with scores between  $\frac{1}{4}$  SD and below the mean were identified as Fint (Maghsudi, 2007; Yamini & Rahnama, 2008).

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