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Developing Strong International Agricultural Education Programs by Understanding Cognition

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Abstract

International experiences provide culturally rich, complex situations for learners to process in both the affective and cognitive domains. By better understanding how learners process the information they receive in international settings, educators can develop quality international programs that encourage learners to more fully develop their cognitive abilities. The purpose of this study was to explore the cognitive relationships between participants' learning styles, problem solving styles, and critical thinking dispositions in an international setting. Relationships were found between learning style preferences and critical thinking disposition, and learning style preferences and problem solving style. Given these results, instructors working in international settings should expect students to differ in terms of their cognitive processes and associated cognitive styles such as learning style. Instructors should be prepared to address these differences in style as they would in a traditional instructional setting. Further, instructors can use assessment tools to group students to work together most effectively and/or to achieve diversity in their thinking styles and approaches to solving problems.

Keywords: Teaching and learning, Instructional design and delivery, Learner characteristics, Learning theory

Introduction

International experiences, such as study abroad opportunities, provide culturally rich, complex situations for learners to process (Bruening & Frick, 2004; Klein & Lawver, 2007). Learning can be assessed within both the affective and cognitive domains. The affective domain refers to personal and intercultural learning (Krathwohl, Bloom, & Masia, 1973). The substantial documentation of gains in personal and intercultural development while studying abroad suggests these are common objectives of this type of experience. In contrast, the cognitive domain refers to increased knowledge and processing skills developed through the learning process (Bloom, Englehart, Furst, Hill, & Krathwohl, 1956). Very little research has been reported on what effects a study abroad experience may have on the cognitive processing students undergo while in the socially complex situations introduced in study abroad settings. By better understanding how learners process the information they receive, educators can develop quality programs that encourage learners to more fully develop their cognitive abilities.

One of the most important of those cognitive abilities is critical thinking. Critical thinking has been defined as having both skills and disposition dimensions. An often cited definition of critical thinking skill developed by an international panel of experts is: "We understand critical thinking to be purposeful, self-regulatory judgment that results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based" (Facione, 1990, p. 2). Critical thinking disposition, the tendency or desire to apply one's thinking skills, has been correlated with intelligence as well as problem solving (Friedel, Irani, Rhoades, Fuhrman, & Gallo, 2008). The lack of research regarding the role of study abroad experiences in critical thinking development indicates educators are likely missing the opportunity to integrate this important skill set into their planned objectives.

Theoretical/Conceptual Framework/Review of Literature

The conceptual framework for this study utilized a conceptual model introduced by Lamm, Rhoades, Snyder, Irani, Roberts, and Brendemuhl (2011) describing the relationships between learning style, critical thinking disposition, and problem solving (see Figure 1). Based on the results of an exploratory study, Lamm et al. (2011) suggested that educators could plan curriculum to enhance critical thinking by considering the students' learning styles (Kolb, 1984; Kolb, 2007) and problem solving styles (Kirton, 2003). This article describes an effort to replicate their findings.

Learning style is defined by the experiential learning theory of development (Kolb, 1984) as an individual's preferred method of gaining knowledge. Kolb (1984) posited that styles of learners separate into four categories: accommodating, assimilating, converging, and diverging. The four styles were developed by assessing the level at which a learner naturally uses specific tendencies while learning. They include reflective observation (reflecting), abstract conceptualization (thinking), active experimentation (doing), and concrete experience (experiencing) (Kolb, 2007).

Typical characteristics associated with each of the four styles were also identified (Kolb, 2007). Individuals with a preference for doing and experiencing are considered accommodators. These individuals put practiced ideas into action, find multiple uses for information, and are easily adaptive. Individuals with a preference for reflection and thinking are considered assimilators. Assimilators look at learning as a gateway to larger ideas and prefer to combine learned information to

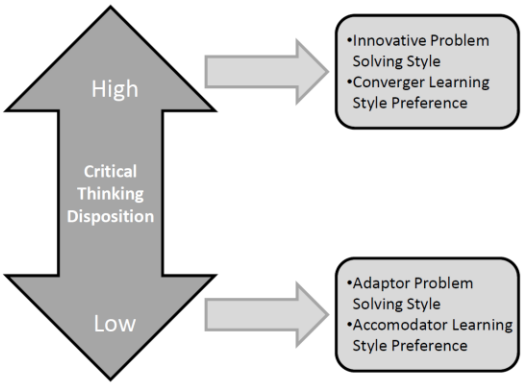

Figure 1. Cognitive relationships conceptual model (Lamm et al., 2011)

create models and theories. Convergers prefer doing and thinking, collecting information to solve problems and prefer to reach a solution by bringing ideas together. Divergers prefer experiencing and reflecting. Divergers view situations from multiple perspectives looking for alternative solutions by diverging from traditional patterns.

Problem solving is defined as an ability to "solve critical, complex problems in challenging environments" (Kirton, 2003, p. 1). The world is ever-changing, therefore problem solving is an essential part of human survival and is naturally innate within each individual (Kirton, 2003). However, each individual approaches problem solving differently. Adaption-Innovation theory (Kirton, 2003) established a continuum between levels of adaption and innovation that represent an individual's preferred cognitive problem solving style. Adaptive individuals narrowly focus their attention to solving problems within defined boundaries while innovative individuals approach problems from a larger perspective, stepping outside of boundaries or defying rules to establish multiple solutions to the same problem. Three constructs comprise problem solving style: sufficiency of originality (a preference for forming solutions), efficiency (a preference to use strategy), and rule/group conformity (a preference for structure) (Kirton, 2003).

Critical thinking has been recognized as one of the most important cognitive traits leading to an individual's success (Irani et al., 2007). Three constructs have been used to describe critical thinking disposition: engagement, cognitive maturity, and innovativeness (Irani et al., 2007). High engagement signifies an ability to anticipate situations, look for opportunities to use reasoning skills, and confidence in reasoning, decision making, and problem solving abilities (Irani et al., 2007). High cognitive maturity signifies knowledge of predisposition prior to making decisions, recognition of the environment's effect on opinions, and openness to the ideas of others. High innovativeness signifies a tendency to look for new knowledge, engage in new challenges, seek more knowledge, and an ability to question present beliefs, adjusting them based on new knowledge or experience (Irani et al., 2007).

The cognitive relationships conceptual model (see Figure 1) explains the theoretical relationships between these three cognitive styles. The research used to create this model showed those with higher critical thinking disposition scores will most likely be innovators, while those with a lower critical thinking disposition score will most likely be adaptors (Lamm et al., 2011). Other studies have shown creative thinking may be what establishes the relationship between critical thinking disposition and

problem solving style (Maltzman, 1960). There is some debate as to whether creative thinking and problem solving are significantly different concepts. Problem solving tendency does not define whether or not an individual is creative, but examines the differences in the way the individual expresses his/her creativity (Kirton, 2003).

Lamm et al. (2011) also found that individuals with a higher critical thinking disposition score were also correlated to those exhibiting a converger preference when learning, while those with a lower critical thinking disposition score were correlated with those exhibiting accommodator preferences while learning. These relationships were not supported by previous literature. Rudd, Baker, and Hoover (2000) reported no significant correlation between learning style and critical thinking disposition while studying this relationship in undergraduate students. Torres and Cano (1995) discovered learning style only accounted for 9% of the variance in critical thinking ability and expressed the need for further study in this area.

In the conceptual model being used for this study, problem solving style and learning style are not correlated and are therefore only connected through critical thinking disposition (Lamm et al., 2011). Past studies have shown reflection was associated with adaptors while action was associated with innovators (Kirton, 2003). If this is shown to be true, adaptors will prefer linear learning modes, while innovators will prefer hands on experiential learning techniques (Kirton, 2003), serving to change this portion of the conceptual model.

Purpose and Objectives

The purpose of this study was to explore the cognitive relationships conceptual model by describing the relationships between participants' learning styles, problem solving styles, and critical thinking dispositions in a study abroad setting. The research objectives were to (a) describe each participant's learning style, problem solving style, and critical thinking disposition, and (b) describe the relationships between the participants' learning style, problem solving style, and critical thinking disposition.

Methods

This study is correlational and descriptive in nature. The population was made up of students participating in a three week study abroad course conducted during the summer of 2010. These participants were chosen because study abroad courses are naturally designed to remove individuals from their typical comfort zone. Individuals in these settings find themselves in unfamiliar surroundings, thereby activating a coping behavior, forcing them to rely on their preferred cognitive style when performing a requested behavior (Kirton, 2003). The course included a problem solving activity where participants were expected to create and market a naturally grown agricultural product to a Latin American audience. The activity was designed to be experiential and to activate the participants' problem solving style while working in groups. The unfamiliar surroundings, problem solving activity, and experiential learning techniques created an environment designed to encourage the use of all three cognitive areas studied. To conduct the study, a census of the 16 college age students enrolled in the course was conducted. Due to this small size, any results cannot be extrapolated beyond the limits of the environment described within the study.

To collect data, participants met with one of the researchers prior to the three week course. At this time, participants were asked to complete the Kolb Learning Style Inventory (LSI; Kolb, 2007). Participants were also asked to complete Kirton's Adaption-Innovation Inventory (KAI; Kirton, 1976) to determine their problem solving style. To gauge critical thinking

disposition, the University of Florida Engagement, Maturity, and Innovativeness test (UF-EMI; Moore, Rudd, & Pennfield, 2002) was used. The researcher was able to use an online design due to the target population's access to the Internet (Dillman, Smyth, & Christian, 2008). Demographic data was also collected online for descriptive purposes.

Instrumentation

Kolb's (2007) LSI was used to determine learning style. The LSI was a 12-item instrument which separates learning style preferences into four categories: concrete experience (CE), active experimentation (AE), reflective observation (RO), and abstract conceptualization (AC). Category scores can range from 12 to 48, with all four categories combining to total 120. Higher scores within a specific category signify a preference for that method of learning. A coefficient alpha level of reliability for the LSI ranging from .73 to .86 has been established by multiple research projects representing a variety of disciplines (Ruble & Stout, 1990).

Problem solving style was established by using the KAI. The KAI was a 32-item continuum based instrument of which totaled responses create an overall score ranging from 32 to 160 (Kirton, 2003). Scores below 95 points were considered adaptors and a score above 95 were considered innovators. Three constructs make up the KAI: sufficiency of originality (a preference for forming solutions), efficiency (a preference to use strategy), and rule/group conformity (a preference for structure). A high level of reliability and validity for this instrument has been established through multiple research studies (Kirton, 2003) with Cronbach's alpha coefficients ranging from .80 to .90 (Taylor, 1989).

Critical thinking disposition was assessed through the UF-EMI. The UF-EMI was made up of 26 Likert-type items measuring three constructs: engagement, cognitive maturity, and innovativeness (Irani et al., 2007). All 26 item scores are summed to create a total score which can range from 26 to 130. A low score indicates a low critical thinking disposition while a high score indicates a high critical thinking disposition. The scale developers report a Cronbach's alpha coefficient of .94 for the UF-EMI (Irani et al., 2007). Reliability is further established with Cronbach's alpha coefficients for the three constructs reported as: engagement, .91; cognitive maturity, .79; and innovativeness, .80.

Data Analysis

Scores for all three inventories, including construct scores, were coded for analysis using PASW18. Descriptive statistics were used to report demographic characteristics and describe each participant's learning style, problem solving style, and critical thinking disposition. Pearson's product-moment correlation coefficient using Davis' (1971) convention was calculated to describe relationships. Relationship magnitude is noted by Davis as $.01 \geq R \geq .09$ = Negligible, $.10 \geq R \geq .29$ = Low, $.30 \geq R \geq .49$ = Moderate, $.50 \geq R \geq .69$ = Substantial, $R \geq .70$ = Very Strong. The proportion of the variation accounted for by the relationship is noted by R^2.

Results

Sixteen participants were recruited to take part in the study representing University of Florida, Purdue University, and Cal State University at Pomona. Seven of the participants were female and nine were male. Their ages ranged from 20 to 28 years. Fifteen of the participants were undergraduate students and one was a graduate student. Thirteen of the participants were White (non-Hispanic), one was Hispanic, one was Black (non-Hispanic), and one reported "other" as their ethnicity.

Cognitive Styles

The participants' preferred learning styles were measured by the LSI (see Table 1). Each of the four categories was represented by the participants. Seven participants were identified as accommodating, two as assimilating, three as converging, and four as diverging.

Table 1
Participants' Learning Style Preferences

Participant #	Inventory	AC	AE	CE	RO
2	Accommodating	25	43	21	31
3	Accommodating	27	39	34	20
5	Accommodating	26	43	25	26
6	Accommodating	20	45	30	25
9	Accommodating	18	46	30	26
10	Accommodating	31	41	28	20
11	Accommodating	23	30	44	23
1	Assimilating	35	27	19	39
13	Assimilating	47	23	29	21
8	Converging	42	32	23	23
14	Converging	34	37	18	31
15	Converging	43	31	29	17
4	Diverging	23	41	21	35
7	Diverging	31	31	30	28
12	Diverging	27	33	30	30
16	Diverging	17	38	32	33

Note. AC = Abstract Conceptualization, AE = Active Experimentation, CE = Concrete Experience, RO = Reflective Observation.

Problem solving style was measured by the KAI inventory (see Table 2). Eight participants were identified as innovators and eight as adaptors.

Table 2
Participant's Problem Solving Style

Participant #	Inventory	SO	E	R	Total Score
15	Innovator	50	23	47	120
13	Innovator	47	24	48	119
8	Innovator	54	19	41	114
2	Innovator	53	16	42	111
10	Innovator	51	18	41	110
6	Innovator	52	23	27	102
9	Innovator	49	18	34	101
12	Innovator	45	13	36	94
14	Adaptor	44	9	37	90
5	Adaptor	43	14	30	87
3	Adaptor	49	16	29	84
11	Adaptor	41	8	35	84
4	Adaptor	42	15	26	83
7	Adaptor	46	16	21	83
16	Adaptor	32	23	20	75
1	Adaptor	29	16	24	70

Note. SO = Sufficiency of Originality, E = Efficiency, R = Rule/Group Conformity.

Participants' critical thinking dispositions were measured by the UF-EMI inventory (see Table 3). Participant scores reflect a range of critical thinking disposition scores from 90 to 121.

Table 3
Participant's Critical Thinking Disposition

Participant #	Engagement	Cognitive Maturity	Innovativeness	Total Score
10	40	39	32	121
8	42	35	33	120
5	41	34	30	114
6	37	33	31	109
9	39	31	30	109
14	38	29	33	109
7	35	33	31	108
2	37	32	27	104
11	37	29	29	103
3	40	27	28	102
15	31	32	28	99
12	34	30	25	96
4	33	27	28	94
1	30	32	26	94
16	29	32	25	93
13	31	23	28	90

Relationships between Learning Style and Critical Thinking Disposition

When LSI preferences are viewed in comparison to the group average scores on the UF-EMI for each preference, those exhibiting an accommodating (M = 108.86, SD = 6.82) or converging (M = 109.33, SD = 10.50) learning style had a high critical thinking disposition score (see Table 4). Those exhibiting either an assimilating (M = 92.00, SD = 2.83) or diverging (M = 97.75, SD = 6.95) learning style had lower total critical thinking disposition scores (UF-EMI).

Table 4
Learning Style Preference Comparisons with Problem Solving and Critical Thinking Scores

LS Preference	UF-EMI Score		KAI Score	
	M	*SD*	*M*	*SD*
Accommodating	108.86	6.82	97.00	11.86
Assimilating	92.00	2.83	94.50	34.65
Converging	109.33	10.50	108.00	15.88
Diverging	97.75	6.95	83.75	7.81

Note. LS = Learning Style, UF-EMI = Engagement, Maturity, and Innovativeness Test, KAI = Kirton's Adaption-Innovation Inventory.

Two of the constructs within the LSI had moderate correlations to the overall UF-EMI score (see Table 5). The active experimentation (AE) construct had a moderate positive correlation (R = .43, R^2 = .18) and the reflective observation (RO) construct had a moderate negative correlation (R = -.37, R^2 = .14) to the overall UF-EMI score. In addition, the active experimentation (AE) construct within the LSI had a substantial positive correlation (R = .50) with the engagement construct within the UF-EMI explaining a quarter of the variance (R^2 = .25) and a moderate positive correlation (R = .35, R^2 = .12) with the cognitive maturity construct within the UF-EMI. The RO construct within the LSI also had moderate negative correlations with the engagement construct (R = -.38, R^2 = .14) and innovativeness construct (R = -.39, R^2 = .15) within the UF-EMI.

Table 5
Correlations between Learning Style Constructs and Critical Thinking Disposition

	AC	AE	RO	CE
Overall UF-EMI	-.02	.43	-.37	-.09
Cognitive Maturity	-.12	.35	-.07	-.17
Innovativeness	.21	.21	-.38	-.15
Engagement	-.13	.50	-.39	.02

Note. AC = Abstract Conceptualization, AE = Active Experimenation, RO = Reflective Observation, CE = Concrete Experience.

Relationships between Learning Style and Problem Solving Style

Learning style preferences were viewed in comparison to mean scores on the KAI for each preference (see Table 4). Individuals exhibiting a diverging learning style tended to have a low problem solving score (KAI) (M = 83.75, SD = 7.81) signifying an adaptor preference. Those with a converging learning style preference exhibited a high KAI score (M = 108.00, SD = 15.88) signifying an innovator preference. Individuals exhibiting accommodator (M = 97.00, SD = 11.86) or assimilator preferences (M = 94.50, SD = 34.65) had average KAI scores, placing them in the center of the KAI measurement scale.

The RO construct within the LSI had a substantial negative correlation to the overall KAI score (R = -.66, R^2 = .43) explaining almost half of the effect (see Table 6). The RO construct was also substantially negatively correlated (R = -.67, R^2 = .45) to the sufficiency of originality (SO) construct and the rule group conformity (RG) construct (R = -.59, R^2 = .35). In addition, the abstract conceptualization construct within the LSI had a substantial positive correlation (R = .62) with the RG construct within the KAI explaining over a third of the variance (R^2 = .38). Lastly, the active experimentation construct within the LSI also had a moderate positive correlation (R = .30, R^2 = .09) to the SO construct within the KAI.

Table 6
Correlations between Learning Style and Problem Solving Style

	Overall KAI	SO	E	RG
Active Experimentation	-.03	.30	-.03	-.23
Abstract Conceptualization	.51	.20	.22	.62
Reflective Observation	-.66	-.67	-.29	-.59
Concrete Experience	-.06	.03	.00	-.05

Note. SO = Sufficiency of Originality, E = Efficiency, RG = Rule/Group Conformity.

Relationships between Problem Solving Style and Critical Thinking Disposition

Problem solving style was viewed in comparison to the mean critical thinking disposition scores for each preference. The innovator average score (M = 106.00, SD = 11.01) and adaptor average scores (M = 102.1, SD = 7.92) were similar. When tested there was a non-significant (t = .81, p = .43) difference between average critical thinking disposition scores for the two groups based on a level of significance set *a priori* at .05.

There were substantial correlations between the constructs making up the participants' critical thinking disposition and their problem solving style (see Table 7). The overall KAI score only had a low positive correlation (R = .28) with the overall UF-EMI score accounting for a small amount of the effect (R^2 = .08). The SO construct within the KAI had substantial positive correlations (R = .56, R^2 = .31) with the overall UF-EMI score, the innovativeness construct within the UF-EMI (R = .53, R^2 = .28), and the engagement construct within the UF-EMI (R = .61, R^2 = .37). The efficiency construct within the KAI also had a moderate negative correlation with the engagement construct within the UF-EMI (R = -.36, R^2 = .13).

Table 7
Correlations between Problem Solving Style and Critical Thinking Disposition

	Overall KAI	SO	E	RG
Overall UF-EMI	.28	.56	-.16	.15
Cognitive Maturity	.10	.17	.08	-.08
Innovativeness	.31	.53	-.14	.19
Engagement	.21	.61	-.36	.17

Note. SO = Sufficiency of Originality, E = Efficiency, RG = Rule/Group Conformity.

Comparing Critical Thinking Disposition, Problem Solving Style, and Learning Style

When individual participant scores on both the UF-EMI and the KAI are compared graphically by their individual learning style, patterns begin to emerge. Figure 2 shows individuals with a converging learning style exhibit higher critical thinking scores (UF-EMI) and higher problem solving scores (KAI) than their peers. In addition, Figure 2 also shows individuals with a diverging learning style exhibit lower critical thinking scores and lower problem solving scores than their peers. Individuals with assimilating learning styles exhibit low critical thinking scores (UF-EMI) but vary widely on problem solving score (KAI) and individuals with an accommodating learning style are well distributed across the median of both the UF-EMI and KAI distributions.

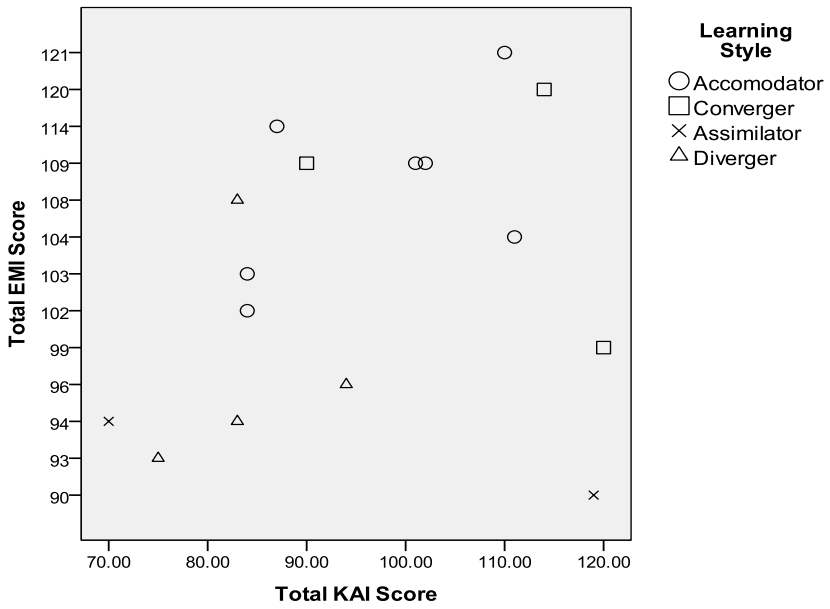

Figure 2. Comparison of critical thinking disposition and problem solving style by learning style.

Conclusions

The purpose of this study was to explore the cognitive relationships conceptual model (Lamm et al., 2011) by describing the relationships between participants' learning styles, problem solving styles, and critical thinking dispositions in a study abroad setting. The students in the population represented each of the learning styles consistent with Kolb's (1984) original classification of learning styles. The accommodating learning style was most prevalent, while there were few assimilators. The population in this study differed from that in the Lamm et al. (2011) study, which had the greatest number of students identifying with the assimilating and diverging learning styles. Equal proportions of students in this study were identified as adaptors and innovators. Despite this distribution, all students tended towards the upper range of critical thinking dispositions (M = 104.06). This contrasts the cognitive relationships conceptual model (Lamm et al., 2011) which links adaptor status with a low critical thinking disposition. In this case, the adaptors' average UF-EMI scores were not lower than the innovators' average UF-EMI score. However, since the mean for these students was higher than the average population mean on the UF-EMI this may not be an accurate representation of this relationship.

A visual comparison of the participants' learning styles and critical thinking dispositions showed evidence of relationships between learning styles and critical thinking. The statistical analysis showed active experimentation and reflective observation learning style preferences were related to the respondents' overall UF-EMI scores, and therefore to critical thinking disposition. More specifically, the active experimentation preference was related to the engagement and cognitive maturity constructs while the reflective observation preference was related to engagement and innovativeness. Overall, the study showed that individuals with a preference for "doing" were more likely to have a "high" critical thinking disposition.

Unlike Rudd et al. (2000), Lamm et al. (2011) found learning style to be correlated with critical thinking disposition. However, Lamm et al. (2011) documented a negative relationship between active experimentation and overall UF-EMI, while this study found a positive relationship. Lamm et al. (2011) did not find a relationship between reflective observation and overall UF-EMI score or the UF-EMI constructs while this study did. Given the conflicting results, more research is needed to understand the relationships between learning style and critical thinking disposition.

Only one relationship was visually evident between problem solving style and learning style; that relationship was between a diverging preference and an adaptor approach to problem solving. Lamm et al. (2011) did not find any relationships between problem solving style and learning style. The statistical analysis for this study showed a relationship between problem solving style and the reflective observation preference for learning. Specifically, individuals with high reflective observation scores had lower sufficiency of originality scores and rule/group conformity scores which led to their conceptualization as adaptors. It can be concluded that a preference for learning by watching – a characteristic of the diverging learning style – is correlated with an adaptor problem solving style.

Two additional relationships existed between learning style preferences and problem solving style constructs. Positive relationships existed between abstract conceptualization and rule/group conformity, and active experimentation and sufficiency of originality. Although the visual analysis of this study's data set did not support a likely relationship between the converging learning style and problem

solving style, the significance of abstract conceptualization and active experimentation with components of the KAI suggests that a larger sample may show a relationship.

All students in this study tended towards the higher end of critical thinking disposition scores despite an equal proportion of innovators and adaptors in the population. A closer look at the data showed a low relationship between problem solving style and critical thinking disposition. However, the sufficiency of originality construct was substantially related to all three critical thinking constructs. It is likely that the observed low relationship between problem solving style and critical thinking disposition is a dilution of the more substantial relationship between the sufficiency of originality construct and critical thinking disposition. This study showed that those with a tendency to generate ideas have higher critical thinking dispositions. This conclusion differs from Lamm et al. (2011) who also found a relationship between critical thinking disposition and problem solving style, but due to relationships between the efficiency and rule/group conformity constructs and problem solving style constructs.

Implications and Recommendations

Study abroad instructors should expect students on international agricultural education trips to differ in terms of their cognitive processes styles such as learning style. Instructors in such settings should be prepared to address these differences in style as they would in a traditional instructional setting. For example, instructors can include integrating more ill-defined problems in their course objectives to draw out the natural cognitive tendencies of students. Further, cognitive assessment of critical thinking, learning style, and problem solving style should be utilized to help instructors understand the thinking and learning processes of students. Instructors can use assessment tools to group students to work together most effectively and/or to achieve diversity in their thinking styles and approach to solving problems. Well-formed groups allow students to "share their conceptual and procedural knowledge in the joint construction of a problem solution, so that all students are actively engaged in the problem-solving process and differences of opinion are resolved in a reasonable manner" (Heller & Hollabaugh, 1992, p. 637).

Results from cognitive assessment tools can also be used to enhance students' awareness of their own strengths and weaknesses when working with others (Kirton, 2003; Kolb, 2007). Therefore, scores (and their interpretations) should be shared with students to deepen their understanding of their own natural tendencies. Not only will this information assist students in working in academic learning groups, but also give them a greater understanding of how they relate to others throughout life (Kirton, 2003; Kolb, 2007).

As assessment tools are used it is imperative to consider what they are measuring. This study showed that individuals exhibiting accommodator and diverging learning styles with a preference for "doing" were more likely to have a "high" critical thinking disposition score. This finding may have implications for the measurement of critical thinking as a disposition or tendency rather than an absolute score. The UF-EMI's current use of a high-low scoring procedure may in fact be misleading, and a more category-based approach, where critical thinking varies along a continuum more like learning style or problem solving style, may be a preferable method that allows a preferred learning style to be related to a preferred critical thinking style. Friedel et al. (2008) also advocated this approach.

From a theoretical standpoint, this study does raise questions with respect to Lamm et al.'s (2011) model, especially in

the relationship between learning style and critical thinking disposition as measured via the UF-EMI. Given this is a correlational study with a relatively modest *N*, care must be taken in terms of inferences, but it does present the opportunity for further research in this area. Testing of the full model with a larger number of participants and in varied international settings should be done in order to make a stronger contribution to our understanding of cognitive processes activated by international study abroad experiences.

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