A STUDY OF CRITICAL THINKING DISPOSITIONS AND INSTRUCTION IN POST-SECONDARY INSTITUTIONS

by

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Abstract

Objectives of this study were: to evaluate individual differences in post-secondary students' critical thinking (CT) dispositions, to assess differences between college and university classroom environments, and to explore relationships between class size, instruction and critical thinking at both the college and university level. Subjects were 31 college students, 39 university students, 3 college instructors and 3 university instructors. Student participants completed the California Critical Thinking Disposition Inventory (CCTDI) and the Classroom Environment Questionnaire (CEQ). Instructors completed the Brief Questionnaire for Instructors. There were significant differences in CT dispositions of males and females ($p < .02$), older and younger students ($p < .04$), and students with college experience versus those with university experience only ($p < .03$). Students' perceptions of classroom instruction at the college versus the university were significantly different ($p < .05$). Results were supported by previous research. Findings have important pedagogical implications for post-secondary educators.

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CHAPTER 1

Introduction and Overview

The purpose of the present study was to explore the relationship between critical thinking (CT) and classroom instruction at the post-secondary level of education. CT has been widely investigated in the education literature, but research on the dispositional component of CT is extremely limited. A primary objective of post-secondary education is to advance students' skills that can be applied beyond the classroom. If the tendency to think critically is encouraged by educators, students may be more likely to use CT skills outside of the academic realm. The virtually unexplored relationship between classroom instruction and CT dispositions was deemed worthy of further investigation because of its potential application in post-secondary classrooms.

A review of the literature revealed that a number of variables might be associated with students' tendency to think critically. Individual differences related to CT dispositions were expected to be age, gender, and academic experiences. Prior research has indicated that the instructional environment may have a significant influence on students' CT skill development. Educators have been concerned for decades that growing class sizes may reduce the quality of instruction in post-secondary classrooms. Although the research on class size reveals mixed findings with regard to student achievement, theoretical discussions of CT suggest that large classes may not be conducive to encouraging CT. It was expected that instructors of small classes might capitalize on opportunities to engage students in activities that encourage CT to a greater extent than instructors of large classes. If this was the case, it was predicted that students with small class experience may have more advanced CT dispositions than students with large class experience only.

This study utilized a survey research design with embedded focus groups to explore relationships between post-secondary students' CT dispositions, individual characteristics,

instruction, and class size. The researcher attempted to isolate the class size variable by comparing CT disposition scores and perceptions of classroom instruction of college and university students taking classes with similar content. Instructors of the students who participated in the study also provided information about their attitudes toward instruction, class size and critical thinking in the post-secondary classroom. Instructor feedback was discussed and compared to students' attitudes. Findings from this investigation were supported by previous research and provided a foundation from which recommendations were made for future research.

CHAPTER 2

Literature review

Teaching students to think critically is a widely accepted goal of post-secondary education (Halpern, 1993). Although there is some disagreement in the education literature over the definition of CT, most leading researchers in the field agree that CT involves both a logical thinking skills component and a dispositional component (Dewey, 1933; Ennis, 1997; Lipman, 1991; McPeck, 1990; Paul, 1988; Seigel, 1992). Fostering students' CT dispositions alongside instruction devoted to CT skill development may increase the application of CT skills outside the educational setting (Facione, Sanchez, Facione & Gainen, 1995). This approach implies that a complete education should include instruction that encourages both components of CT. However, the majority of the empirical CT research literature focuses on the skill component of CT. Most research studies report a small but positive influence of post-secondary education on students' CT skills (MacMillan, 1987). Despite the pedagogical value of understanding dispositional CT, there are very few studies that examine potential educational influences on students' CT dispositions.

The paucity of empirical research on CT dispositions is not entirely surprising considering the only published measure of CT dispositions to date is reasonably recent. The California Critical Thinking Dispositions Inveventory (CCTDI) was developed by Facione and Facione in 1992. The CCTDI is based on an expert consensus definition for critical thinking published in the Delphi Report (American Philosophical Association, 1990). This report is the result of a two-year project by a panel of 46 theoreticians from various disciplines of study from the United States and Canada. The report identifies five core CT skills: interpretation, analysis, inference, evaluation and explanation. The report emphasizes the dispositional component of CT, describing the ideal critical thinker as:

> Habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making

> judgements, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit. (American Philisophical Association, 1990, p. 3).

The CCTDI groups these descriptors into larger categories for assessment purposes: open-mindedness, analyticity, cognitive maturity, truth-seeking, systematicity, inquisitiveness and critical thinking self-confidence. The Delphi report predicts that the ideal critical thinker will be more inclined to use CT skills because of these dispositions.

Limited empirical investigations of the CCTDI and CT theory support a relationship between the two constructs. The interactionist hypothesis predicts that a strong disposition toward CT will lead to a greater inclination to use CT skills and conversely, a weak CT disposition will lead to a disinclination to use CT skills (Facione et al., 1995). Two investigations of construct validity of the CCTDI reported by Facione, Facione & Sanchez (1994) found highly significant correlations ($r = .66$ and $.67$) with the California Critical Thinking Skills Test (CCTST). These assertions suggest that individuals with strong CT dispositions may utilize a larger repertoire of CT skills. Evidence that CT skills and dispositions are related and mutually reinforcing supports the argument that both should be simultaneously encouraged in the educational environment. Information about individual differences in students' characteristics associated with both CT skills and dispositions may have pedagogical value for educators.

In one of the few empirical studies examining the disposition to think critically among post-secondary students, Bers, McGowen, and Rubin (1996) found that student dispositions toward CT as measured by the CCTDI were related to age, educational level, and gender. Students aged 25 and older had significantly higher scores than younger students on all subscales except open-mindedness ($p < .02$). Females had higher scores than males on three subscales: truth-seeking ($p < .05$), open-mindedness ($p < .02$), maturity ($p < .01$) and total

CCTDI scores ($p < .02$). Students with more post-secondary education, as measured by number of credits, had higher CT scores than students with less education on three subscales: truth-seeking ($p < .003$), CT self-confidence ($p < .006$), analyticity ($p < .02$) and total CCTDI scores ($p < .002$). Conversely, Profetto-McGrath (1998) found no relationship between CT dispositions and educational experience, as measured by year of study in a nursing program. The evaluation of educational experience based on number of credits or years of study leaves out other potentially influential educational variables; for example: type of program, instruction, institutional characteristics and class size. A better controlled study may produce more meaningful findings for educators.

Facione et al. (1995) provided additional evidence of gender differences in the CT dispositions of post-secondary students. Females had higher scores than males on two of the dispositional scales on the CCTDI: open-mindedness ($p < .002$) and maturity ($p < .001$); while males had higher scores than females on the analyticity subscale ($p < .043$). There were no significant gender differences on overall scores of the CCTDI. Due to the limited research on CT dispositions, it is difficult to make any assertions about this component of critical thinking. Future research on CT dispositions is necessary.

A review of the CT skill literature provides a relevant background for future research on dispositional CT. If the two components of CT are mutually reinforcing, it could be expected that variables that influence one component also influence the other. Individual characteristics associated with CT skills may reveal additional information about differences in CT dispositions associated with gender, age and educational experiences.

The CT literature reveals mixed results with regard to gender differences. King, Wood and Mines (1990) investigated the influence of post-secondary education on students, finding that males had significantly higher overall CT scores than females. CT was measured by the Watson-Glaser Critical Thinking Appraisal (WGCTA) and the Cornell Critical Thinking Test (CCTT). Lehman (1961) found sex differences in terms of beliefs related to CT: females were found to be more open-minded than male students. Gender differences were not found

in overall CT ability of post-secondary students, however. There may be more significant gender differences associated with CT dispositions but not with CT skills. Uncertainty surrounding gender issues and CT constitutes need for future research in this area.

Another study that examined educational influences on student CT (Terenzi, Springer, Pascarella & Nora, 1995) found no gender differences in CT. Unlike most CT research studies that evaluate CT using the WGCTA, however, CT was measured with the Collegiate Assessment of Academic Proficiency (CAAP). This instrument may not measure CT skills that are associated with gender differences. An analysis of the differences between instruments may demonstrate which CT skills are associated with gender differences. Data were collected from 327 students at the beginning and end of the academic year, finding significant improvements in CT ability. This study provides evidence that the educational experience was related to improvements in CT ability. There is considerable evidence in the literature of a positive influence of education on CT skills, although the mechanisms that underlie this relationship remain unexplored.

The majority of CT research finds a positive relationship between CT skills and education. Lehman (1961) demonstrated that student CT ability likely improves over the course of a four year post-secondary experience. He conducted a longitudinal study of students over four years of study at a post-secondary institution. The CT abilities of 1051 students were assessed using the Test of Critical Thinking (TCT). Students had significantly higher scores in their senior year compared to scores obtained in their freshman year. It is unclear if improvements in CT ability were attributable to the educational experience or to developmental factors not associated with the academic experience. King et al. (1990) also found positive trends between years of study and CT scores, but these differences were minimal when the researcher accounted for academic ability.

Keeley, Browne and Kreutzer (1982) compared the critical thinking skills of freshman students to those of senior students. CT was measured by students' ability to critically evaluate essays. A group of 145 freshman and 155 seniors participated in the study.

Although senior students were found to more advanced in their CT abilities than freshman students, overall CT levels of seniors were low. Post-secondary education may not encourage CT skills to the degree necessary for students to meet their CT potential. It is difficult to know if differences between freshman and seniors were attributable to cognitive development associated with age or academic influences associated with educational level. Future research should control for potentially confounding academic variables to provide more accurate information about the development of student CT ability.

Mines, King, Hood and Wood (1990) provided additional evidence that the acquisition of CT skills is positively associated with education. Students' critical thinking skills were assessed with the WGCTA. One hundred students participated in the study: 20 freshman, 40 seniors and 40 graduate students. Scores were significantly and positively related to educational level, controlling for pre-college academic ability and academic ability at the time of testing. The results of this study suggest that CT skills develop independent of other academic abilities and that pre-college academic aptitude is not a predictor of CT skill gains in college. These findings demonstrate the impact of post-secondary education on CT skills.

In a rare longitudinal investigation of CT abilities using an academically matched group of college and non-college students, Pascarella (1990) found a significant positive influence of post-secondary education on critical thinking ability. Subjects in the study graduated from the same high school and were matched according to levels of academic achievement. Half of this group of 34 subjects attended college upon completion of high school while the other half did not. Subjects completed the WGCTA prior to high school graduation and one year later. The CT scores of the group in this study who did not attend college increased significantly over the course of a year but the CT scores of the group who attended college increased to a greater extent. Gains in CT ability in college were not related to pre-college characteristics such as academic ability, CT skills, educational goals or economic status. The results of this study suggest that post-secondary education may lead to greater gains in CT ability than from what could be expected from maturation alone. Educators would further

benefit from further understanding the educational influences that improve students CT abilities.

The educational environment at the post-secondary level likely has considerable impact on students' academic development (Astin, 1984). Limited research on the relationship between the educational environment and academic ability leaves this issue essentially unexamined, despite its potential value. There have been even fewer empirical examinations of environmental influences on students' CT skills in post-secondary institutions. In addition, most CT studies involve students who attend large colleges and universities in the United States (MacMillan, 1987). Few empirical studies have examined the influence of Canadian colleges and universities on students' CT skills and dispositions. Students would benefit from understanding the differences between institutions when deciding what school best suits their academic needs. Research investigating environmental influences on students' CT and academic abilities would also provide valuable information to institutions in terms of educational development and educational resource allocation.

An empirical investigation by Smith (1977) found a positive relationship between certain classroom interactions and the CT of post-secondary students. Student participation, faculty encouragement, faculty use of student ideas, and peer to peer interaction were significantly and positively related to high levels of students' CT as measured by the WGCTA. Active student involvement may therefore lead to improvements in student critical thinking. One limitation of this study was that the 12 classrooms from which subjects were assessed had an unrepresentative average class size of 17.5 students. Although this may indicate that small class sizes allow for high levels of student participation and faculty support in the classroom, this cannot be properly assessed without a comparison group of students in larger classes. Research that examines educational environment variables such as class size and its influence on instructional quality and student involvement may have further implications for institutional development and instruction.

Terenzi et al. (1995) examined aspects of college students' academic experiences and CT

abilities. Increases in critical thinking were significantly associated with both students' class-related and out-of-class experiences, as measured by the College Student Experiences Questionnaire (CSEQ) and a survey developed by the researchers. Class-related experiences experiences included number of hours studying in a week, instructor effectiveness and library experiences. The out-of-class experiences included the quality of relationships with other students and number of unassigned books read each year. The degree to which a student is motivated to become involved in the academic experience may be related to dispositional CT (Halpern, 1983). If instructors encourage student CT dispositions, this might increase student involvement leading to more advanced CT abilities.

An examination of the literature on academic achievement and the educational environment provides a relevant background for studies of CT in education. Most empirical investigations of CT have found a positive relationship between academic achievement and CT (MacMillan, 1987). It could be expected that variables that encourage academic achievement are similarly associated with critical thinking.

Nichols (1964) examined the influence of 91 different colleges on student academic ability as measured by the Graduate Record Examination (GRE). The only significant differences in student ability across institutions were that students from some institutions predictably had high verbal scores, while students from other institutions had predictably high quantitative scores. Very few students had high scores on both the verbal and quantitative sections. No definable characteristics of the institutions studied were predictive of an influence either way, however. Environmental factors such as faculty-student ratio, library books per student, and affluence of the institution, were not related to student achievement as measured by the GRE. This research suggests that post-secondary institutions may differentially encourage either verbal or quantitative ability in the classroom and other environmental factors may not have a significant influence on overall ability. This study was limited in that it did not examine potential influences such as class size and instructional quality, information that may have accounted for the differences in student

academic ability across institutions.

Rock, Centra and Linn (1970) found several environmental characteristics of the post-secondary institution associated with achievement. Student achievement scores from 95 colleges in the United States were examined. Faculty-student ratio was not a characteristic associated with higher levels of achievement. Environmental variables associated with smaller colleges such as class size were not examined in this study. Two characteristics found to be positively related to academic achievement were college income per student and proportion of faculty with a doctorate. Perhaps institutions with more resources are able to offer a higher quality learning environment. These findings also suggest that instructors with more education contribute to greater student achievement. Proportion of faculty with a doctorate is a defining difference between colleges and universities in Canada. This is a variable that has not been examined in the Canadian educational literature but warrants further attention.

Centra and Rock (1971) conducted another study on college characteristics and found that levels of faculty-student interaction and curriculum flexibility were related to academic achievement. Environments of 27 American colleges were compared and subjects completed the Graduate Record Examination (GRE) and the Questionnaire on Student and College Characteristics (QSCC). Faculty-student interaction was defined in this study as "the extent to which students feel that the faculty are interested in teaching and in students as individuals" (Centra & Rock, 1971, p. 625) and curriculum flexibility was described as "the degree to which students have freedom in choosing courses and can experiment before selecting a major" (Centra & Rock, 1971, p. 625). Environmental features of post-secondary institutions which were found to be related to student achievement in this study were ones over which an institution presumably has some control. This has important implications for educators. Students may not only benefit from faculty support, but also from programs that do not demand that majors are chosen immediately upon entrance. The study is limited, however, in that it does not explore specific instructional factors that might be related to

academic achievement. A study that examines these variables could provide meaningful pedagogical information.

An earlier study by Terenzi, Theophilides and Lorang (1984) provided additional evidence that student reports of involvement were related to achievement. More specifically, levels of classroom and social involvement, peer relations and both academic and non-academic faculty contact were significantly related to achievement. Most of the research in this area suggests that educational institutions which provide opportunities for students to participate in class and communicate with faculty members may lead to significant student improvements in academic and CT ability.

The literature on post-secondary student involvement in the educational environment demonstrates that faculty-student interaction is a positive predictor of students' academic success (Astin, 1984). In addition, students who interact frequently with faculty members have been found to be more likely to express satisfaction with most aspects of the educational environment than students who interact with faculty less often. A lower student-faculty ratio, which is a likely predictor of high levels of student-faculty interaction, is widely believed to be beneficial to student learning. This belief is based on the individualized attention that instructors can potentially provide to students of smaller classes. The advantages of smaller classes with regard to CT have been the focus of considerable theoretical discussion but limited empirical study. The majority of the research on post-secondary environmental variables and class size has focused on academic achievement as the outcome measure.

Although it seems reasonable to expect that smaller classes are associated with high academic achievement, the educational literature reveals mixed findings with regard to this relationship. A meta-analysis of research on class size at the post-secondary level found that smaller classes were associated with higher levels of student achievement (Smith & Glass, 1980). Other research suggests that student achievement may have less to do with class size than quality of classroom instruction (Vale, 1995). Furthermore, there have been few empirical investigations of class size and student CT. This disparity combined with

inconsistencies in the literature with regard to class size and achievement constitutes a need for future research in this area.

A meta-analysis by Smith and Glass (1980) on class size examined variables such as achievement, instruction and student and faculty attitudes toward the educational experience. Results were based on a statistical integration of 59 class size studies with 371 findings. Small class sizes were positively associated with: individualization of instruction, student participation in learning, learning enrichment, positive student behaviours, teacher control, positive student and teacher attitudes toward the educational experience, positive student interpersonal relationships, quality of instruction and overall school climate. The beta value for the overall effect size of the relationship between class size and instructional quality was .47. These findings should be interpreted with some degree of caution, however, as the most significant results came from studies with uncontrolled research designs. Poorly designed studies accounted for 60% of the studies used in the meta-analysis, so the class size effect may have been inflated to some degree. Nevertheless, the researchers claimed that there were consistent and beneficial effects of small class sizes across the research literature which were related not only to student achievement levels but also to positive instructional and attitudinal variables.

McKeachie (1990) conducted a review of the literature on class size at the college level, and concluded that there is no advantage in smaller classes over larger ones if general achievement is used as the criterion measure. However, smaller classes were shown to be positively related to other academic variables such as retention, problem solving and student and teacher attitudes. The ways in which small classes advance student learning may depend on the teaching approaches used by individual instructors. McKeachie's synthesis of class size research suggests that large classes may not effectively lead to gains in student performance if higher order thinking skills such as CT are used as a criterion measure (Follman, 1994). It is difficult to make assertions about this relationship, however, as empirical investigations of CT and class size are few. Future research on class size and

higher order thinking would be valuable.

Most educators believe that smaller classes provide an environment conducive to teaching for CT (Follman, 1994). Individualized instruction and student participation, typical of small class environments, are theoretically expected to encourage student CT (Halpern, 1993). The effective implementation of teaching strategies which encourage CT, however, may depend on individual teaching styles, student needs and class size (Weston, 1991). The fact that these variables are varied and unpredictable makes it difficult to establish comprehensive teaching strategies for teaching CT in post-secondary classrooms. Small classes have been shown to nurture positive instructor and student attitudes toward the overall educational experience (Smith & Glass, 1980), but research to date has not specifically explored student and instructor attitudes toward CT in the classroom. Research on instructor attitudes toward CT and teaching methods provides evidence that post-secondary instructors may not consistently encourage student CT despite its predicted value.

King et al. (1990) proposed that faculty may often overestimate post-secondary students critical thinking abilities. This may lead to ineffectual teaching practices if students are incapable of interpreting information as it is presented or discussed during class. This prediction was supported by Browne, Hoag and Berilla (1995) in an article that examined the relationship between faculty perceptions of graduate student CT ability and classroom instruction. The researchers reviewed survey data, finding that most graduate instructors strongly advocate the development of students' critical thinking abilities. The researchers argue that this faculty support of critical thinking does not consistently manifest itself into classroom instruction that encourages CT skills. This disparity between faculty beliefs and instruction was illustrated by findings reviewed in this study which demonstrated that post-secondary graduate teaching practices are dominated by the lecture method. This is surprising considering that graduate classrooms are typically smaller, providing an environment conducive to teaching methods that encourage critical thinking. Future research on the teaching practices of instructors in both small and large undergraduate classrooms

would provide pedagogical information to instructors wanting to implement CT teaching strategies into the classroom.

Most post-secondary instructors believe that small classes are superior to large classes in terms of effective instruction and student learning (McKeachie, 1980). The empirical literature finds that smaller classes are related to higher instructor morale, more positive attitudes toward students, manageable workloads, less absences, organization and advanced professional growth (Smith & Glass, 1980). Despite these favourable attitudes of instructors toward smaller classes, budget restraints in post-secondary education are leading to growing class sizes. Although class size may not necessarily be related to overall student achievement, large classes may not maximize higher-order thinking processes such as critical thinking (Follman, 1984). Research on instructors' attitudes toward class size and CT instruction is very limited.

There has been little empirical research on specific instructional methods which encourage CT in the classroom (MacMillan, 1987) with findings which might be considered discouraging to educators. Dressel and Mayhew (1954) evaluated the effect of different instructional methods and different instructors on students CT. Instructional methods included instruction specifically directed toward CT (i.e.: teaching students the principles of logic). The CT ability of 680 students was assessed using the Test of Critical Thinking in Social Sciences (TCTSS). There were no significant differences in student CT ability found among classes that used different instructional methods. There were, however, significant differences found in students CT abilities among sections of the same course taught by different instructors using similar teaching strategies. Instructional methods may be a less significant variable in the development of students' CT skills and dispositions than characteristics associated with individual instructors.

Lyle (1958) examined the influence of a course specifically designed to encourage CT on students' CT abilities. The CT skills of a group of students taking a psychology course designed to encourage CT were compared to a group of students taking a traditionally taught

psychology course. Both groups were taught by the same instructor. There were no significant differences, indicating that instructional methods designed to enhance CT had less of an influence than expected. The findings of the previous two studies suggest that the instructional method may not be as influential as individual instructor characteristics in terms of encouraging student CT. Research which looks at how teaching style and other individual instructor characteristics influence both CT skills and CT dispositions would have educational value.

A Need for Research

The previous review of the educational literature finds little agreement with regard to influences on student CT ability. There have been mixed findings in the literature with regard to gender differences in CT and the influence of instructional variables on CT. There has been very limited attention in the research literature on class size and student CT. Most research studies on the influence of academic environments on student academic development have focused on colleges and universities in the United States. Research on post-secondary classrooms in Canada is needed. An understanding of the potentially differential educational influences of both college and university environments would be valuable for both students and educators. In addition, there has been minimal research on potential influences on CT dispositions in the academic environment. The educational importance of an investigation that examines institutional and instructional factors contributing to CT dispositions sanctions a need for research in this area. The present study will respond to the following research questions:

1) Is the disposition to think critically related to student characteristics of age, gender and post-secondary experiences?

2) Do college and university students differ in their perceptions of the extent to which their instructors encouraging critical thinking in the classroom?

3) How are class size and instruction related to the critical thinking dispositions of students?

4) What are instructors' attitudes toward CT in the classroom?

CHAPTER 3

Method

Research Design

A survey research design with embedded focus groups was utilized to respond to the research questions. The CT dispositions and perceptions of classroom instruction of a group of college students and a group of university students were assessed. Students were also asked to provide demographic information including their age, gender and post-secondary experience. Some participants also participated in focus-group sessions to discuss issues such as class size, instruction and critical thinking. Instructors were surveyed to assess their attitudes toward CT in post-secondary classroom environments.

Subjects

Thirty-one college students, 39 university students and 6 instructors (3 from each institution) participated by completing and returning questionnaires. Eleven student participants also participated in one of four focus-groups. Students were recruited from four 200-level social science classes at Camosun College and four 200-level social science classes with similar course content at the University of Victoria. Permission was requested and obtained from the instructors of each of these classes to: 1) recruit students during class time (see Appendix A), and 2) participate in the study themselves (see Appendix B). Anonymity of the instructors was protected by reporting neither the course titles nor a description of the courses. Each class was coded according to subject (e.g.: Class 1 at the college had similar course content to Class 1 at the university). A more detailed description of the recruitment process is presented in the procedure. Table 1 presents the breakdown of subjects according to institution, with subject characteristics of age, gender and academic experience. Also included in Table 1 is the questionnaire administration procedure for each class (described in the procedure section), number of participants and response rates. Response rate refers to the percentage of students in each class who participated in the study following recruitment.

Table 1

Sample Profile, Response Rates and Questionnaire Administration Procedure

Institution/Class		Mean Age*	% Female	Procedure	N	RR
College	1	24.8	33%	Supervised	9	41%
	2	28.6	60%	Supervised	10	48%
	3	23.0	58%	Supervised	7	30%
	4	22.0	66%	Take home	6	50%
	Mean Totals	24.6	54%		32	42%
UVic	1	24.9	70%	30% Supervised 70% Take home	10	14%
	2	20.3	100%	Supervised	3	2%
	3	29.3	60%	Take home	5	33%
	4	24.2	65%	Take home	21	29%
	Mean Totals	24.7	74%		39	14%

*Ages ranged from 20 to 47 years at the college, and 20 to 45 years at the university.

Measures

The instrument used to assess students' critical thinking dispositions was the California Critical Thinking Dispositions Inventory (CCTDI) (Facione et al, 1994). The CCTDI has 75 Likert-style items and reports a score on each of the seven scales (Inquisitiveness, Open-mindedness, Systematicity, Analyticity, Truth-seeking, CT Self-Confidence and Maturity) and an overall score of CT disposition. Sample items from each CCTDI subscale are presented in Appendix C.

The CCTDI is the first objective measure of dispositional dimensions of CT; therefore, there have been no investigations that have assessed the convergent validity of this measure. There have been significant correlations found between individual CCTDI scales and

established psychological scales which measure constructs expected to be related to CT dispositions (Facione, 1992). An investigation of the overall relationship between scores on the CCTDI and the California Critical Thinking Skills Test (CCTST) found highly significant correlations (Facione & Facione, 1992) demonstrating convergent validity. Chronbach's coefficient alpha for the CCTDI in this study was found to be .74, demonstrating internal consistency between scale items and overall test score reliability.

The Classroom Environment Questionnaire (CEQ) was administered to subjects to assess the extent to which students perceive their instructors encouraging critical thinking in the classroom (see Appendix D). This questionnaire was developed by the researcher. The test is comprised of 20 Likert style items and reports individual scores for each item. Scores represent a rating of how strongly students agree or disagree that their instructor encourages CT in the classroom. Items on the CEQ were based on theoretical characterizations of dispositional critical thinking from the Delphi Report (American Philisophical Association, 1991). These characterizations, along with the CEQ item that they were designed to reflect, are presented in Appendix E. The CCTDI was also based on characterizations of critical thinking dispositions from the Delphi report, so categories are presented where applicable.

Prior to data collection, the CEQ was piloted with 15 Camosun College students who were not involved in the study. The purpose of the pilot test was to assess the clarity, relevance and comprehension of individual items. Some of the items were modified and some removed from the instrument based on comments by students. The content validity of the instrument was also assessed by three external judges who agreed, after discussion with the researcher and revision of several test items, that the items represented the characteristics of CT disposition on which they were based. The CEQ was revised four times during this process. The coeffeicient alpha for the CEQ was found to be .82, demonstrating internal consistency of the measure.

The focus-group questions are presented in Appendix F. These questions were designed to address how students perceive their overall educational experience. The questions were

also intended to provoke descriptive responses about some of the instructor variables addressed in the CEQ.

The Brief Questionnaire for Instructors (BQI) (Appendix G) has five questions related to CT in the classroom. This questionnaire was designed to solicit descriptive responses that provide information about how individual instructors encourage CT in the classroom. The BQI was also developed by the researcher.

Procedure

Participants were administered questionnaires outside of class time according to one of two procedures: supervised or take-home. This information was presented in Table 1. It was predicted that by allowing subjects to take questionnaires home instead of supervising this procedure, the response rate of students would increase. When students were provided with the take-home option, the mean response rates at Camosun College and the University of Victoria increased by 10% and 27%, respectively. Subjects from Classes 1, 2 and 3 at the college, Class 2 and 30% of Class 1 at the university were supervised during questionnaire administration. Subjects from Class 4 at the college, Classes 3, 4 and 70% of Class 1 at the university took questionnaires home. Students from Class 1 at the university who were unable to participate after class (supervised procedure) but wished to participate in the study provided the researcher with a phone number. These students were contacted one week later and given take-home questionnaires. To further encourage student participation, Class 2, 3 and 4 at the university and Class 4 at the college were told that here would be a reward for participating in the study. Participants who completed and returned a questionnaire had their name entered into a draw for two sets of double movie passes with a value of $20 each.

The student questionnaire consisted of four parts: 1) Participation form (Appendix H), 2) Post-secondary experience form (Appendix I), 3) the CCTDI, and 4) the CEQ. Subjects were told of their rights as subjects (as indicated on the participation form) during the recruitment process, and were told that it would take approximately 20 to 30 minutes to fill out all

sections of the questionnaire.

Supervised subjects completed the questionnaires after class in a room designated by the researcher. Subjects had the option of participating in a focus-group discussion following this session, requiring approximately 20 to 30 more minutes. Students who wished to participate in the focus group were instructed to remain in the room after the questionnaire administration and wait for all subjects to complete the questionnaire. Some of the focus-group questions were elaborated and extended by the group facilitator, while some questions were not discussion in full detail in each session. Only one of the sessions was tape-recorded, the facilitator took notes as a means of collecting data in the other three sessions. There were 11 focus-group participants in total; six subjects participated in two sessions at the university (three participants per session) and five subjects participated in two sessions at the college (two participants in one session and three in another).

Subjects recruited from class to take questionnaires home were provided with the questionnaire during class time. The instructor was asked to leave the room when students were asked to indicate if they wished to participate in the study. Subjects were asked to return the questionnaire, either complete or incomplete, to the researcher via inter-departmental mail at their earliest convenience. Questionnaires were in an envelope marked with the researcher's name and department. Subjects who took questionnaires home did not have the option of participating in a focus-group session.

Instructors were given a participation form and the BQI on the day of student recruitment for their class. This package was also in an envelope marked with the researcher's name and department. Instructors were asked to return the questionnaire, complete or incomplete, at their earliest convenience.

CHAPTER 4

Results

In order to assess differences between groups, quantitative data from the CCTDI and the CEQ were treated with two-tailed t-tests. Focus group data was analyzed using student responses as a justification for the dominant themes that emerged during the sessions (Miles & Huberman, 1984). BQI responses were analyzed using instructor responses as a justification for overall attitudes of instructors toward CT in the classroom. The results are organized in response to each of the research questions.

1. *Is the disposition to think critically related to student characteristics of age, gender and post-secondary experiences?*

In order to determine if students' dispositions toward critical thinking were related to age, gender and post-secondary experiences; mean subscale and total scores of the CCTDI were examined for these variables. Table 2 presents statistically significant results for younger and older students (younger than 25 and 25 or older, respectively), for females and males, and for students with college experience and those with only university experience. Some participants did not provide demographic information such as age, gender, and post-secondary experiences. Data from students who did not provide information related to these variables were not included in relevant analyses. Older students had significantly higher inquisitiveness ($p < .04$), systematicity ($p < .01$) and CT self-confidence ($p < .03$) subscale scores and total CCTDI scores ($p < .01$) overall than did younger students. Females had significantly higher open-mindedness ($p < .02$), CT self-confidence ($p < .01$) subscale scores and total CCTDI scores ($p < .01$) overall than did male students. Students with college experience had higher CT self-confidence scores than did students with only university experience ($p < .03$).

Table 2

Significant Differences in Subscale and Total CCTDI Scores

Variable	Subscale	Mean	N	t-value	p-value
Age	Inquisitiveness				
	Younger	45.76	42	2.19	$p < .04$
	Older	50.06	16		
	CT Self-confidence				
	Younger	41.59	42	2.94	$p < .03$
	Older	47.06	16		
	Systematicity				
	Younger	37.33	42	2.88	$p < .01$
	Older	43.75	16		
	Total				
	Younger	296.88	42	3.66	$p < .01$
	Older	320.48	16		
Gender	Open-Mindedness				
	Female	48.00	43	2.56	$p < .02$
	Male	44.85	26		
	CT Self-confidence				
	Female	45.40	43	3.24	$p < .01$
	Male	39.23	26		
	Total				
	Female	311.42	43	3.11	$p < .01$
	Male	291.62	26		
Academic Experience					
	CT Self-confidence				
	College experience	44.58	45	2.23	$p < .03$
	University only	40.20	25		

2. *Do college and university students differ in their perceptions of the degree to which instructors encourage critical thinking in the classroom?*

Table 3 presents results that show statistically significant mean differences between institutions on individual CEQ items. Students at the university agreed more strongly than

students at the college that their instructors: 1) present information from a wide variety of relevant sources, 2) are clear about stating the objectives for class at the beginning of class, and 3) encourage students to prepare for class by reading material in advance. Students at the college agreed more strongly than students at the university that their instructors: 1) require students to understand a variety of concepts, not just memorize material, 2) have students work in groups of two or more to discuss and share perspectives during class, 3) expect students to provide evidence and/or reasons to support their perspectives, and 4) plan activities during class which help students to think about class material. Table 3 displays significance levels for all differences.

3. *How are class size and instruction related to the critical thinking dispositions of students?*

In order to determine if there was a relationship between dispositional CT and classroom instruction in this study, scores on the CCTDI subscales were compared to individual CEQ items for all classes. Focus group discussions also revealed how students perceived the instruction in their classes.

Inquisitiveness scores were positively related to student reports that instructors: (2) present information in class from a wide variety of sources ($r = .24$, $p < .05$), and (5) encourage students to challenge the reasons which support their beliefs ($r = .36$, $p < .01$). CT self-confidence scores were positively related to student reports that instructors: (2) present information in class from a wide variety of sources ($r = .29$, $p < .02$), (3) recommend that students seek information from sources other than the textbook ($r = .30$, $p < .01$), (4) require students demonstrate an understanding of concepts, not just memorize information ($r = .35$, $p < .01$), (5) encourage students to challenge the reasons which support their beliefs ($r = .34$, $p < .01$), (13) help students to recognize how information learned in class is applicable outside of the classroom ($r = .47$, $p < .01$), (14) expect students to think

Table 3

Significant Differences Between Institutions on Individual CEQ items

CEQ Item and Institution	Mean	N	t-value	p-value
(2) My instructor presents information in class from a wide variety of relevant sources.				
College	4.06	32	2.73	< .01
University	4.87	39		
(4) I am required to do more than memorize information for class, I am required to demonstrate an understanding of a variety of topics.				
College	5.18	32	2.06	< .05
University	4.66	39		
(7) We often work in groups of two of more during class to discuss issues and share our perspectives.				
College	4.12	32	3.97	< .01
University	2.18	39		
(8) My instructor expects us to provide evidence and/or reasons to support our positions.				
College	4.31	32	1.92	< .06
University	3.56	39		
(10) My instructor is clear in stating objectives for class at the beginning of lectures.				
College	4.34	32	2.44	< .02
University	5.02	39		
(17) My instructor often plans activities during class which help us to think about class material.				
College	3.75	32	2.50	< .02
University	2.69	39		
(20) We are encouraged to be organized and prepare for class by reading material in advance.				
College	4.73	32	2.73	< .01
University	5.43	39		

through complex ideas until material is clearly understood ($r = .2363$, $p > .05$), (16) frequently ask for feedback about classroom instruction and assessment ($r = .29$, $p < .01$).

Systematicity scores were negatively related to student reports that instructors (14)

encourage students to think through complex ideas until they clearly understand course material ($r = -.25$, $p < .04$). Truth-seeking scores positively related to student reports that instructors (3) encourage students to seek out information from sources other than the textbook ($r = .24$, $p < .05$). Open-mindedness scores were negatively related to student reports that instructors (8) expect students to provide evidence and/or reasons to support their positions ($r = -.30$, $p < 01$), and to (18) expect students to consider a number of perspectives on an issue, not just one ($r = -.24$, $p < .05$).

There were no significant differences between college and university students with regard to CT dispositions. This suggests that immediate class size experiences were not related to students' CT dispositions. Immediate class size experiences refer to the institution subjects were attending at the time of the study: college students were presumed to have had mainly small class experiences and university students were expected to have experienced primarily large classes. This should be distinguished from academic experience; there were subjects who had college experience prior to university experience and therefore also had considerable small class experience. Table 4 presents the overall CT disposition profile of all college and university students who participated in the study.

Focus Group Discussions

Focus group discussions with students provided general impressions of how class size and instruction are related to how effectively students are encouraged to think critically. Responses have been summarized and categorized according dominant pedagogical themes that emerged from all sessions. Student responses are categorized according to the following dominant themes: 1) group activities in the classroom, 2) the importance of relevance, 3) effective instruction, 4) subject matter and student interest, and 5) encouraging critical thinking. This analysis uses a qualitative report style taken from Miles and Huberman (1984) for drawing and verifying conclusions about themes drawn from the data. Each section

Table 4

Overall CT Disposition Profile of College and University Students

CCTDI Subscale	Mean	Standard Deviation
Truth-seeking	37.86	6.52
Systematicity	39.59	7.76
Analyticity	42.63	5.19
CT Self-confidence	43.01	8.09
Maturity	44.89	6.88
Open-mindedness	46.76	5.13
Inquisitiveness	46.89	6.69
Total scores	303.41	27.40

begins with an assertion that is followed by a brief elaboration where necessary. Each assertion is supported with the following evidence: 1) a description of the number of subjects who agreed with the statement, 2) student opinions, and 3) student elaborations on each theme. If a group is not included in the number of subjects who agreed with a theme, this does not necessarily mean that the group disagreed with the assertion. Some groups did not discuss particular themes, so their opinions about these themes could not be provided as evidence.

Group activities in the classroom. Group activities are a valuable component of learning in the post-secondary classroom. Group activities help students to 1) learn material, 2) think critically about material, and 3) develop unbiased opinions. All focus group participants from both institutions agreed with this assertion. Students at the university felt that large

classes which are primarily lecture-based limit students to the perspective of the instructor. Lectures may "reinforce biases...[leading to biased] opinion formation." Group activities alleviate this problem by helping students to "share their own perspectives," allowing students to "realize how incomplete their knowledge is," and understand how their "own opinions and judgements might be flawed." Group discussion may also help students to recognize that "the whole is greater than the sum of its parts." All of the members from both university focus groups agreed that approximately 90% of university classes do not provide students with an opportunity to participate during class or to work in groups.

University students felt that it is possible to have group work incorporated into a large class. The instructor of one of the classes from which students were recruited frequently asks students to briefly share their understandings of course material in groups of two. This activity helps students to "feel comfortable in the large class" and provides an opportunity for students to ask questions in a small group environment when it might be too intimidating to ask questions in front of the whole class."

College students had positive comments about the group work, which is a major component of almost all college classes. Students believed that the advantage of the small class over a large one is that students are typically encouraged to discuss material. Students may learn most effectively by "listening and talking" about course material. Group work may also facilitate student confidence, as expressed by one student: "[I] feel comfortable with the people in class because of groups...you feel okay to ask questions because [other students] may feel less judgmental if they know you." Activities involving discussion provide an opportunity for students to "compromise, give and take" and "cooperate" which are important abilities which can be applied in the "real world." Some students expressed that although group work is a valuable learning component of the small class, it should be combined with other activities. The effectiveness of the group activities for learning may also depend on individual personalities: "Some people express themselves [best] with talking, others with writing." College students agreed that students should be exposed to more than

one learning method.

The importance of relevance. It is important for instructors to show students how the material learned in class is relevant outside of the classroom. Demonstrations of relevance motivate students to learn material effectively. All subjects from the university and one of the college focus groups emphasized the importance of relevance in the classroom. Students at the university agreed that instructors should more effectively demonstrate how material learned in class is applicable in the real world. Many instructors seem to discourage student interest by failing to do this. The multiple-choice testing in most university classes does not encourage students to independently think about the relevance of memorized material. Students may become better motivated to learn how material is relevant if there were "short answer exams, involving application".

Students at the college believed that most of their instructors effectively facilitate student motivation to learn by demonstrating how course material is relevant outside of the classroom. It was expressed that it is "important for instructors to give examples of real life situations, and actually apply [material] to something." Students believed that it was possible to show relevance in all subject areas.

Effective instruction. Instruction is one of the most important educational variables for effective learning and thinking. Quality of instruction is more important than class size in encouraging learning, although instructors may have more of an opportunity to offer high quality instruction in smaller classes. All participants from both institutions agreed with this assertion. Some university students agreed that most instructors "do not have the skills" necessary to encourage effective thinking. Many do not seem motivated to teach and are not able to communicate effectively with students. Most students believed the majority of instructors at the university fail to speak to students at a level which students are comfortable, and lack the personal skills necessary to "relate to students." More teacher education was

recommended. University students also felt that instructors should be more passionate about what they teach. This enthusiasm is "contagious... it forces you to think critically about the material." Group members agreed that it is rare to have an instructor who is excited about what they teach.

College students also believed that instruction is the most important factor in encouraging critical thinking and effective learning. The implication of this is that instructors must "know how to teach." Students seemed impressed with the overall quality of instruction at the college. Many reported having positive and productive relationships with their instructors. Students reported that most instructors know all of the names of their students and were described as being accessible "both in and out of class."

Subject matter and learning. Subject matter is an important factor in the degree to which students think critically and learn material. If students are interested in the material they are taught, they will be more motivated to learn. In addition, some subject matter does not lend itself to critical thinking. All college students and one university group focus group agreed with this assertion. University students described the class from which they were recruited as "not lending itself to critical analysis" because of the nature of the subject matter. College students believed that individual interest in a subject is a significant factor in how effectively students learn material: "if you aren't interested, you won't learn it." One student described the class from which he was recruited as "so interesting, I would still enjoy class even without group discussion." Inherent interest in particular subject matter may be a predictor of success in a particular course.

Encouraging critical thinking. Students are not receiving enough instruction which: 1) encourages critical thinking, 2) teaches students the principals of critical thinking. The large majority of focus-group participants did not seem to have a clear understanding of critical thinking and did not seem comfortable using the term during discussions. One participant at

the college did attempt a definition of CT as applied to the classroom: "[We] look at what's presented in front of us and decide on the strengths and weaknesses of that argument, and based on those strengths or weaknesses, [decide] whether you should agree with what you read, or disagree with it." When the facilitator asked students how they believed instruction facilitated CT in the classroom, students responses infrequently included the words "critical thinking." Most students replaced "critical thinking" with "learning" when responding to such questions.

Some university students agreed that programs should be more holistic and less specialized so students learn to become more open-minded. One student suggested that the school include a logic course as a requirement for all social science programs. She believed that learning the principals of logic helped her to generalize her critical thinking skills. She felt advantaged over students who did not have this knowledge in that she could apply this skill in many subsequent classes and situations.

Other university students felt that students need to have a clearer understanding of what critical thinking is. Critical thinking was described as an optional component of most university course work, so most students do not know how to do it when it is occasionally required of them. It was agreed that critical thinking is "valuable," it helps students to "look at different sides of a problem, deeper...to the heart of the problem." It was recommended that instructors teach students directly how to develop their CT skills.

4. What are instructors' attitudes toward critical thinking in the classroom?

In order to gain an understanding of instructors' attitudes toward CT in the classroom, instructors of the classes from which subjects were recruited were asked to fill out the BQI in their own time and return it to the researcher. Six of the eight instructors returned the questionnaire, three from each institution. The responses have been organized according to the question asked, and comparisons between institutions are presented where applicable.

Instructors were first asked to define critical thinking. Definitions of CT were varied

among instructors. CT was described by college instructors as: "The ability to examine the world with an independent mind," "The ability to collect data from a variety of sources, which is then processed to reach a unique practical solution," "the attempt to grasp a deeper meaning of problems, issues free of 'one thought' or 'black/white' thinking, independent of other's opinions." CT was described by university instructors as: "knowing what to ask, asking what is NOT there," "comparison of components of an argument to see if they are consistent with themselves and with previous knowledge, to see if they lead to a single conclusion," "evaluations of information to see if the point being made is substantiated by evidence marshalled for it," and "the ability to contrast and compare different points of view and/or theoretical positions...to confront and discuss dilemmas in a field of study and to provide a superordinate explanations of local or single pieces of information/research." Definitions provided by instructors demonstrated that each had an understanding of at least some of the principals which underlie CT. The inconsistency with regard to CT definitions in the literature makes it difficult to assess the accuracy of each description.

Instructors were next asked to describe how they encourage their students to think critically. Respondents at the college believed that class discussion and group work are important ways of facilitating CT in the classroom. Instructors reported facilitating CT by: "encouraging students to ask difficult questions in class, and by creating an environment in which they feel free to do so without any apprehension," "giving [students] open-ended exercises, by giving detailed examples of critical thinking in others, [and] by encouraging classroom discussions on open-ended issues." Another instructor described how she modelled and assessed CT in the classroom: "I try to pose issues in a balanced perspective. I encourage students to share their opinions with me as well as one another in group discussions."

Two university instructors attempted to encourage CT in the classroom by modelling this behaviour. For example: "by contrasting oppositional ideas, reading original work," and "presenting contrasting points of view and discussing how knowledge affects them in every day life and asking for ideas that might explain contrasting points of view." One instructor

reported facilitating student CT directly by advising students to "integrate course material, relate information to their own lives, keep their reality checkers on," also encouraging them to "distinguish the more important material," and in a 150-person class, provides time for students to "talk to each other about the material." According to focus-group data, small group work is rarely conducted in large classes. This instructor may less representative of university instructors than the instructors who indicated that they encourage CT by modelling it.

Four of the six respondents indicated that the material for the course from which students were recruited lent itself well to the assessment of critical thinking skills. Two university instructors felt that the material for the course partially lent itself to the assessment of CT skills. The rationale for each response varied across institutions, despite the fact that some courses had comparable subject matter. A college instructor believed that the "course is based on applications," so student CT skills are readily assessed. The instructor of the same course at the university felt that the subject matter only partially lent itself to CT, because "half of the course is taken up with presenting the rudiments, [only] later we can discuss why mainstream research lacks explanatory power. [Students] expect knowledge that can be measured by multiple-choice exams."

Two other instructors of a course with similar content at different institutions had varied explanations for why the material for the course lent itself to the assessment of CT skills. The college instructor believed that "the material for this course is almost entirely analytical, rather than descriptive and the focus of my teaching is the examination of various theories." The university instructor felt that "original writings by theorists and contrasting views" contribute to his ability to assess CT skills in the classroom. Another instructor at the university felt that the material for the course partially lends itself to the assessment of CT skills because "there is a lot of factual information to learn. Only later do conclusions come that can be evaluated by students."

All of the college instructors but only two of the three university instructors who

responded to the questionnaire felt strongly that the size of their class was a factor in how effectively they are able to teach students to think critically. One instructor felt that "critical thinking is achieved by practice, rather than being lectured to...therefore, a small class of some 25 students is much more conducive to being conducted as a seminar, thus enhancing student participation in discussion." Another instructor elaborated by indicating that "if I had over 40 students, I would be forced out of the model of small group involvement, and more into lecture mode."

Two instructors at the university felt that they could encourage CT more effectively if they had smaller classes, one instructor felt that class size is irrelevant. One respondent felt that smaller classes allow for more "in depth evaluations...It is hard to evaluate the critical thinking of 150 people." He believed that students prepare themselves for the type of exam they expect. They will only value critical thinking if they believe it will matter to them at exam time." Another respondent stated that "it's hard for students to feel involved in class discussions. Many students get used to not critically examining their assumptions and sharing their experiences - they coast because it is easier in a larger class."

One instructor surveyed provided additional comments about critical thinking and instruction at the university, emphasizing that university students are not provided with the opportunities they need to learn to think critically. He described how many "good" students complain to him that "they are being given low grades for criticizing the prof's approach to the discipline." He stated that most university professors wrongly believe that CT is a "knee-jerk rejection of mainstream thought. They have the tendency to tell students which views are bad without any real discussion of the pros/cons of those views." This problem is exacerbated with a "zero tolerance for criticism of the 'good views.'" He proceeded to describe how students at various levels of achievement are affected by this situation: "My best students...have zero respect for the profs who stifle truly critical thought. I fear the worst students are being brainwashed. The average students are probably bored or confused!"

One instructor at the university and one instructor at the college indicated that they had

formal training teaching either critical thinking or related topics. All other instructors indicated that they had not had such training. Both had utilized resources at their respective institutions that offer teacher training.

CHAPTER 5

Discussion

The objectives of the present study were: to evaluate individual differences in post-secondary students dispositions toward CT; to assess differences in college and university classroom instructional environments; to determine if students' classroom experiences were related to CT dispositions; and to evaluate student and instructor attitudes toward class size, instruction and critical thinking at both the college and university level. The findings reveal important information about critical thinking in post-secondary education. There were significant differences in the critical thinking dispositions of males and females, older and younger students, and students with college experience versus those with university experience only. Students' perceptions of classroom instruction at the college versus the university were significantly different. Students impressions of classroom instruction were found to be related to scores on the CCTDI. Both students and instructors contributed valuable information about their attitudes toward post-secondary education in terms of instruction, class size and critical thinking. The findings of this study support prior research findings and also provide a unique contribution to the CT literature. Limitations of the study in terms of research design and analysis mean that the findings should be interpreted with some caution. The present study provides a foundation from which recommendations were made for future research on CT in post-secondary education.

Information about individual differences in CT disposition scores may be useful for educators in terms of understanding differential student attitudes and behaviours. Females were found to have higher CT self-confidence, open-mindedness and total CT disposition scores than males. CT self-confidence refers to confidence in one's personal judgements and the belief that others look to oneself to resolve problems, decide what to do, and bring reasonable closure to inquiry. Open-mindedness refers to tolerance of divergent views and

the sensitivity to one's own bias. A social-role interpretation of gender differences suggests that females may act according to roles involving care for the emotional needs of others and helping others toward their goals (Eagly, 1987). Although today's social norms do not dictate that females conform exclusively to the role of caregiver, learning theory predicts that females may learn to behave from older role models who do behave according to this traditional role (Halpern, 1992). Females may have more self-confidence in their CT skills, help others to solve their problems and be open to divergent views and behaviours because the role of the care-giver is partially epitomized by these dispositions.

Females were also found to have higher total CT disposition scores. This finding counters research which finds that males perform better than females on tasks of formal reasoning (Halpern, 1992). Prior CT research, however, supports similar gender differences in CT dispositions. Bers et al. (1995) found that females had higher truth-seeking, open-mindedness, maturity and total scores as measured by the CCTDI. The researchers predicted that males and females have different cognitive styles, which lead to differential thinking tendencies. Research by Belinky et al. (1986) recounted by Bers et al. (1995) provided evidence that females are more likely to develop a connected way of knowing, while males are more likely to develop a separate way of knowing. Connected knowers tend to manage ambiguity and link new information to previous knowledge. Separate knowers have a tendency to look for flaws in new concept, but are less likely to refer to prior knowledge to respond to new knowledge. Bers et al. (1995) suggested that open-mindedness, truth-seeking and maturity dispositions may be related to a connected way of knowing because these tendencies are related to the ability to tolerate conflicting opinions and to accept divergent views. Belinky's research on gender differences in cognitive styles may partially explain the gender differences in CT dispositions found in this study.

The present study found evidence of age differences in critical thinking dispositions. Older students (25 years of age or older) had significantly higher scores on inquisitiveness, CT self-confidence, systematicity subscales of the CCTDI. Bers et al found that college

students aged 25 or older had higher scores on all of the subscales except open-mindedness. Findings from both Bers et al. and the present study support research by Kitchner and King (1993) which suggests that the tendency to think critically increases with age, and may therefore be associated with normal human development. A learning perspective propounds that students may learn to become more inquisitive, self-confident about their CT skills and systematic because they are rewarded for this behaviour in the academic environment. Future CT research should compare individuals with post-secondary education to those without this background. This research will help to determine if improvement in CT dispositions can be attributed to development growth, academic experience, or a combination of both factors.

Although there were no differences in the CT dispositions of college and university students overall, students with college experience were found to have significantly higher CT self-confidence scores than students with university experience only. This finding may be explained by differential classroom experiences of college and university students. Smaller classes typically incorporate more group work than larger classes, which are traditionally dominated by the lecture. Small group work may provide opportunities for communication and critical thinking which allows students to build confidence in their reasoning skills. Students with academic experiences limited to the large lecture class may not have as many opportunities to develop confidence in their own reasoning abilities as they are less frequently called upon to defend their judgements. CT self-confidence is related to the extent to which others seek out one's advice with regard to solving problems and confidence in one's own reasoning abilities. It is not surprising that students with small group experiences associated with the college classroom have more self-confidence in their CT skills than university students with primarily large class experience. The results of this study suggest that students' confidence in using CT skills may be associated with the small class environment of the college experience.

The overall profile of students' CCTDI scores indicates that students have a moderate,

but positive disposition toward CT. According to Facione (1992), this is characteristic of both a community college and university population. The lowest mean subscale scores were truth-seeking and systematicity. Truth-seeking refers to how eager students are to seek the truth, ask questions and pursue independent inquiry. The large majority participants in the present study were second year students. It may be that students do not become active truth-seekers until later in life. This finding is supported by Perry (1970), who asserts that individuals begin their intellectual development as passive learners who look to authority for the right answers. Systematicity targets the disposition toward organized, orderly, focused and diligent inquiry. It is not entirely surprising that the second year students in this study did not have high scores on this subscale. Systematicity may be a learned trait that becomes predominant later in the academic experience. Most of the students who participated in the study were social science majors. Subjects may have less experience with the systematic approach to research frequently practiced by students in the natural sciences. Formal, systematic research methods are not typically practiced in the social sciences until third or fourth year. Future CT research should look at the differences in students' CT dispositions across disciplines and year of study.

Students' highest mean subscale scores on the CCTDI were open-mindedness and inquisitiveness. These findings are consistent with previous CT disposition research that also found post-secondary students scored highest on these subscales (Bers et al., 1995). Open-mindedness may be related to openness, a personality trait that has been subject to considerable psychological research (Facione, 1992). Most research has shown that openness reaches lifetime stable levels by the time adolescents enter college (Tyler & Schuller, 1991; Zonderman, Siegler, Barefoot & Williams, 1993). Curiosity, a personality trait expected to be related to inquisitiveness, has been shown to decrease as a function of age in elementary school (Englehard & Mansas, 1988), but reaches stable levels in early adulthood (Camp, Rodrigue & Olson, 1984). Levels of openness and curiosity might remain consistent for most individuals over the course of the lifespan, but this has yet to be examined empirically. If

levels of open-mindedness and inquisitiveness follow a similar developmental pattern, these high scores may remain stable for most individuals' lives. The academic experience may advance these particular dispositions, however, so the high scores of post-secondary students in this study may not be representative of the population at large. Future research should explore age differences in open-mindedness and inquisitiveness using subjects with varied academic backgrounds.

The present study found differences in student and faculty perceptions of college and university classroom environments. Significant differences in college and university students' responses to the CEQ may have important implications for educators. Students at the university agreed more strongly than college students that their instructors: 1) present information from a wide variety of relevant sources, 2) are clear in stating objectives for the class at the beginning of lectures, 3) encourage students to be organized and prepare for class by reading material in advance. These findings may be attributable to a number of factors. The publication requirements of university instructors often necessitate considerable research within a specific area of study. Instructors presumably teach material which they have researched themselves and may therefore share with students a wide variety of relevant sources connected with both this research and class material. College instructors are not required to conduct research, and may not necessarily access multiple sources of information prior to presenting material to students. This prediction is supported by research that finds a positive relationship between student achievement and proportion of faculty with a doctorate (Rock, Centra & Linn, 1970). In addition, college instructors may not lecture to the extent that the university instructor does. Students would be less likely to perceive their instructors as presenting information from a wide variety of sources if lecturing is not the primary teaching method in the classroom.

University guidelines for the teaching and organization of courses and programs explicates that instructors must "present his or her expectations and the course material in a clear and well-structured manner" and be "up-to-date in his or her subject area" (University

of Victoria Policy, section 2800, 2.1). Instructors are evaluated on the basis of university guidelines when they are considered for tenure positions, so there is likely motivation for instructors to establish these practices in the classroom. It is not surprising, then, that university students perceive their instructors as clearly defining objectives each class and presenting material from a wide variety of sources. Although the college offers Instructional Skills Workshops (ISW) for new faculty members that includes tips for delivery of information to students in the classroom (ISW Handbook, p. 43); participation in these workshops is not mandatory. The college does not have comparable formal policies for instruction to those of the university with regard to classroom presentation. In addition, the question inquired about the teaching behaviour of the instructor prior to lectures, not prior to class activities that constitute a large portion of most college classes. College students may have disagreed to a greater extent than university students that their instructors present class objectives prior to lectures simply because college instructors do not predictably lecture each class.

University instructors may encourage students to be organized and prepare for class by reading material in advance to a greater degree than college instructors for a number of reasons. The absence of group work in the large university class environment means that there are likely fewer opportunities for students to clarify misunderstandings about course material. University instructors may emphasize the importance of preparing for class so students can follow lectures without having to communicate with other students during class or interrupting the instructor. College instructors may encourage questions during lectures because there are more opportunities for students to do so.

College students believed more strongly than university students that their instructors: 1) require students to do more than memorize information for class, but demonstrate an understanding of a variety of concepts, 2) have students work in groups of two or more during class to discuss issues and share perspectives, 3) expect students to provide evidence and/or reasons to support their positions, 4) plan activities during class time which help

students to think about class material. University students are likely required to memorize material to a greater extent than college students for assessment purposes. Large classes are conducive to multiple-choice assessment measures, which typically require students to retain large amounts of material. A lower student-faculty ratio at the college may better allow instructors to assess student understanding of material. Instructors may have more time to mark short answer or essay questions involving critical thought, and allot participation marks to students based on their verbal interpretations of course material. Essay exams and group discussions may require that students use CT skills to a greater extent than multiple-choice exams and lecture classes. In-depth assessment measures may account for the finding that college students agree more than university students that their instructors frequently ask them to provide evidence to support their positions, and activity that involves CT.

The small class environment at the college may be more conducive to group work and class activities than the large class environment of the university. Smaller classes are easily divided into small groups to discuss issues surrounding class material. Instructors of small classes could independently monitor student learning activities and respond to student queries without the help of a teaching assistant. University instructors may feel forced into lecture mode because group work with classes of 100 students may be too difficulty to monitor even with the help of a teaching assistant. Furthermore, instructors may be unaware of teaching methods that encourage active learning in large classrooms. Most of the research at the post-secondary level on teaching large classes is based on theory; teaching methods have been infrequently subject to empirical examination. Instructors would benefit from evaluations of various methods of facilitating group work and learning activities that encourage CT in the large class.

The present study found that student responses on the CEQ were associated with CCTDI scores. It cannot be assumed that CT dispositions are related to classroom experiences based on this finding, however. The CEQ is designed to evaluate student impressions of one classroom in particular, so four classrooms cannot be expected to be representative of the

classroom experience as a whole at each institution. A representative sample of students from various disciplines at each institution would provide a broader perspective of the educational experience. Future research using self-report measures of the educational environment should utilize a larger sample of subjects to increase the validity of results. Because of the small sample used in this study, it cannot be assumed that differences in perceptions of college and university students toward their instructors are representative of the institutions as a whole. Moreover, the validity and reliability of the CEQ has not been shown in previous studies as it was developed by the researcher for the purpose of this study. An longitudinal empirical study which examines the influence of specific instructional interventions may also provide more convincing evidence that there is a relationship between instruction which is designed to encourage CT and students' CT skills.

Although there were significant differences in student impressions of the classroom instruction between institutions, there were no related differences in CT dispositions of college and university students. Relationships found between the CEQ and the CCTDI are therefore likely attributable to factors other than differential experiences at the college and the university. Students with high scores on various subscales may simply agree more strongly with certain questions on the CEQ and disagreed more strongly with others. Students with high scores on inquisitiveness, CT self-confidence, and truth-seeking, agreed more strongly on some CEQ items that their instructors provide a classroom environment that encourages CT. Students with high scores on the systematicity and open-mindedness subscales disagreed with several CEQ items related to the degree to which their instructor encouraged CT in the classroom. It seems that individual differences in CT dispositions are related to predictable response patterns on the CEQ. Reasons for this are not entirely clear. Perhaps a strong disposition toward leads students to become more aware of the CT principals that underlie their instructors' teaching methods. To better understand students' attitudes toward classroom instruction, future research should examine the relationship between students' CT dispositions and perceptions of classroom instruction.

CT dispositions of college and university were not found to be significantly different in this study. This finding may be attributable to the nature of CT dispositions themselves. Dispositions are similar to personality characteristics which are predictably more stable than CT skills (Facione, 1992). Students' CT dispositions have been associated with age and academic experiences in both the present study and in previous research, but the experience of two years at a college or a university may not be enough to significantly change students' CT dispositions. There has been no research to date of potential long-term influences on CT dispositions. Future longitudinal studies examining CT dispositions and students' academic and non-academic experiences would be valuable. This research would help educators to understand the extent to which the academic experience contributes to students' CT dispositions and other related characteristics.

Focus group participants shared their academic experiences related to classroom instruction, class size and critical thinking. Responses were based on students' academic experiences at college, university, or a combination of the two. University and college students agreed that the most important factors for effective learning were group activities, instructional quality, understanding the relevance of material and overall interest in the subject matter. Students would prefer small classes, but did not believe them to be essential for effective learning. College and university instructors had varied opinions with regard to class size and encouraging CT in the classroom. Comparing how the instructors report how they encourage CT in the classroom with the attitudes of students toward the learning experience reveals differences in opinion between students and instructors toward some academic issues.

Students strongly believed that group activities are a valuable component of the classroom experience and contribute to effective learning. Although university students reported having minimal exposure to group work in the classroom, students believed in its value both theoretically and in practice. Perhaps most importantly, university students felt that it is possible to incorporate group activities into the large class experience. College

students felt comfortable working in groups and felt they benefited considerably from the small group experience. University instructors may not realize that group work in the small class is not only possible, but also highly beneficial for student learning. College instructors described group work as a main component of the classroom experience as they believed it contributed to student CT. Conversely, most university instructors used modelling CT as a way of encouraging CT in the classroom. Only one university instructor specifically used group work as a means of encouraging CT. If instructors had more feedback from students with regard to their teaching methods, they may be more likely to incorporate group work in the classroom. The extent to which teachers and students communicate and offer one another feedback about teaching and learning was not explored in this study. Future research should examine the relationship between student-instructor communication and teaching methods that encourage CT.

Instruction was described as the most important variable for effective learning in the classroom by both college and university students. University students felt that most of their instructors do not have the skills necessary to teach effectively. College students, however, seemed pleased with the overall instructional quality in their classes. This finding may related to the likelihood that university instructors focus more on research and devote less time to improving their teaching methods. Conversely, college instructors are not required to conduct research and may have more time to be involved with teacher training. Only one instructor from each institution reported having any training related to critical thinking, however. Although both the college and the university offer teacher training for instructors, the majority of instructors who participated in this study did not utilize these resources. Future research should examine the relationship between instructor training and instruction that encourages CT in the classroom.

Students from both the college and the university believed that instructors should show students how material learned in class is relevant outside the classroom. Students believed that they are most motivated to learn when they understand how they can apply their

academic knowledge outside of the school setting. Only one instructor discussed how application is important for teaching and assessing CT, however. Instructors may perceive the material that they teach students as unmistakably relevant, and therefore neglect to explicitly describe its relevance to students. Future research should compare the attitudes of instructors and students with regard to their perceptions of subject relevance. Instructors may need to better understand that students benefit from clear explanations of how material is relevant outside of the classroom.

Interest in a subject was described as a necessary and motivating factor for student learning. Students believed that instructors can only influence students to a certain degree to become interested in material; there must be individual interest in the subject to inspire meaningful learning. University instructors were not asked to comment on the relationship between student interest and learning or teaching, so this learning factor cannot be discussed from the perspective of the instructor. Instructors may inherently find the subject matter of their courses interesting and neglect to encourage student enthusiasm to the extent that is necessary to pique students' interest. This is an issue that deserves further attention in the research literature.

Students and instructors had varied opinions with regard to class size and its impact on teaching and learning. University students asserted that although smaller classes are preferable in terms of learning, instructors of large classes could advance learning to a greater extent by integrating group work into the classroom experience. Students at the college felt positively about their learning experiences in small classes. All of the college instructors and two of the university instructors believed that CT is best encouraged in a small class environment. Only one university instructor found that class size was an irrelevant factor with regard to student learning. University instructors believed that the necessary multiple-choice assessment in their large classes does not lend itself to student CT, and students will not learn to think critically unless it is required of them on exams. Instructors may not have the knowledge of teaching tools necessary to encourage CT in the classroom, regardless of

class size and means of learning assessment. Research that explores large class CT assessment measures would be very valuable for the university instructor.

Focus group sessions revealed that students did not have a clear understanding of what critical thinking is; this may be a reflection of some of the shortcomings of post-secondary education in terms of teaching for CT. Instructors at both the college and the university may not use effective methods for teaching CT in their classes, despite their own knowledge of the construct. It may be that instructors' dispositions toward CT are related to the extent to which students' learn to think critically. This relationship was not examined in this study, but deserves future inquiry. Instructors may benefit from teacher training and more knowledge of where their students stand in terms of their CT abilities. Prior research has shown that university instructors overestimate student levels of CT ability, and subsequently neglect to teach students CT skills (Brown et al., 1995). Future research should look at the relationship between instructor knowledge of students' CT levels and instruction specifically devoted to CT skill development.

Methodological limitations of the present study did not allow for an extensive examination of instructional variables that contribute to CT. The volunteer nature of the recruitment process and the inconsistent recruitment methods meant that participant students and instructors may not have been representative of the overall population at their respective institution. Furthermore, the limited number of subjects in the study reduced the validity of the research results in this study. It was difficult to make assumptions about the nature of the relationship between instruction and CT dispositions because the instrument used to evaluate the instructional environment may not have been empirically sound. Despite these methodological shortcomings, the study did provide some evidence of differences in instructional variables that contribute to CT at the college and the university. Future research on CT dispositions and post-secondary instruction should utilize a larger sample and more extensive methods for evaluating classroom instruction.

The findings of this study indicate that CT dispositions were significantly associated

with gender, age and academic experiences. There were no differences in the CT dispositions of college and university students overall, however. College and university students did have significantly different perceptions of the extent to which the instruction in their classes encourages CT. College instructors reported using group work and discussion to encourage CT in the classroom, while university instructors mainly model critical thought for students. The issue of class size at the post-secondary level is an important one; increasing class size may have an impact of the quality of the education for post-secondary students. Instructors may benefit from training that will enable them to maintain high standards of instruction in both small and large classrooms. This study indicated that CT dispositions are likely affected by a variety of student characteristics and academic experiences. Continued research in this area is recommended to further advance educators' understanding of instruction and CT dispositions in post-secondary classrooms.

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Appendix A

MEMORANDUM

TO: The Instructor

FROM: Jennifer Peckover, Faculty of Education, University of Victoria

RE: Request for brief participation in a study and permission to recruit students

I am an M.A. student in Educational Psychology and am writing you with regard to my thesis research study. I am writing to request 1) your brief participation in a study, and 2) your permission to recruit students from your Sociology 210 class to participate in a study entitled, "Critical thinking in post-secondary education: influence of class size and instruction." A brief summary of the purpose and methodology of this study is attached. The study has been approved by the University of Victoria Human Research Ethics Committee.

With your consent, I would ask that you complete a brief questionnaire on critical thinking in the classroom. This could be filled out at your convenience and requires approximately 10 minutes of your time. Your participation in the study would be completely confidential, neither your identity nor the class which you teach would be associated with the study in any way.

With your permission, I would require 12 - 13 subjects from your class to participate in the study outside of class time. I would ask for only five minutes of your class time to briefly explain to students the purpose of my study and their rights as subjects in a psychological study. I would distribute a sign-up sheet on which students could indicate whether or not they plan to participate in the study, which I would retrieve immediately. Administration of the questionnaire and brief focus-group discussions would require one hour of the students' time after class. I would be pleased to provide all participants with feedback regarding the results of my study.

I would be prepared to introduce the study to students one week before testing. I would ask that students meet with me after class the following week in a designated room for one hour. I have no objection to you reviewing the questionnaire and focus-group questions prior to making your decision. I am planning to collect data during the last 2 weeks of February and the first week of March, 1998.

Thank-you for considering my request. I can be reached at Camosun College where I work as an instructional assistant at 370-3195 or at home at 382-9881. I can also be contacted via e-mail at "jjp@uvic.ca." My supervisor for this project is Dr. Don Knowles, Faculty of Education, who can be reached at 721-7792.

Appendix B

Consent Form for Instructors

The purpose of this study is to examine how the instruction in your classes helps students to think critically. You will be asked to fill out a brief questionnaire that assesses your views on critical thinking in the classroom. There are five questions that require short written answers. The questionnaire takes approximately five minutes to respond to, and can be filled out at your own convenience.

Your participation in this study is voluntary, and you are not required to provide any explanation for withdrawing from the study. In addition, you may refuse to answer any question on the questionnaire without explanation.

All of the data from this study will be kept entirely confidential, only the researcher will have access to the data. Your identity will not be associated with either the results of the study or the questionnaire. Your name will be coded immediately after the questionnaire is returned. Your anonymity will be protected as the nature of your class will be kept entirely confidential. Neither the title nor a description of the course will be described in the final report of this study.

I have read and hereby agree to all of the above statements regarding my participation in this study.

Signature of participant: _____

If you wish to have a summary of the results of this study mailed to you, please include your name and address and/or your E-mail address:

_____

_____

_____

_____

E-Mail address: _____

Researcher: Jennifer Peckover
382-9881
Supervisor: Dr. Don Knowles
382-7792

Appendix C

SAMPLE CCTDI ITEMS AND DESCRIPTIONS OF EACH SCALE
from Facione (1995)

Inquisitiveness Scale

"...measures one's intellectual curiosity and one's desire for learning even when the application of the knowledge in not readily apparent."

Sample items: "No matter what the topic, I am eager to know more about it," and "Learn everything you can, you never know when it will come in handy," and "Studying new things all my life would be wonderful."

Open-mindedness Scale

"...addresses being tolerant of divergent views and sensitive to the possibility of one's own bias."

Sample items: "Open-mindedness has its limits when it comes to right and wrong," and "It concerns me that I might have biases of which I am not aware" and "It is important for me to understand what other people think about things."

Systematicity Scale

"...measures being organized, orderly, focused, and diligent in inquiry."

Sample items: "I always focus on the question before I attempt to answer it," and "My problem is I'm easily distracted," and "people say I rush into decisions too quickly."

Analyticity Scale

"...targets prizing the application of reasoning and the use of evidence to resolve problems, anticipating potential conceptual or practical difficulties, and consistently being alert to the need to intervene"

Sample items: "I pretend to be logical, but I'm not," and "there is no way to know whether one solution is better than another," and "it bothers me when people rely on weak arguments to defend good ideas."

CT Self-confidence Scale

"...measures the trust one places in one's own reasoning process."

Sample items: "Tests that require thinking, not just memorization, are better for me," and "I take pride in my ability to understand the opinions of others."

Maturity Scale

"...targets the disposition to be judicious in one's decision making."

Sample items: "The best argument for an idea is how you feel about it at the moment," and "Things are as they appear to be," and "The best way to solve problems is to ask someone else for the answers."

Appendix D

Classroom Environment Questionnaire

Students are asked to respond to the following statements by indicating on a scale of one to six the extent to which they agree/disagree with the statement by circling the appropriate number. A scale similar to the one below is provided for each question on the questionnaire.

Agree Strongly 1 2 3 4 5 6 Disagree Strongly

1. We are encouraged to ask questions during class about class material or related topics.

2. My instructor presents information in class from a wide variety of relevant sources.

3. My instructor frequently recommends that we seek information from sources other than the textbook.

4. I am required to do more than memorize information for class, I am required to demonstrate an understanding of a variety of concepts.

5. My instructor encourages us to challenge the reasons that support our own beliefs.

6. My instructor addresses the differences between cultures with regard to some issues.

7. We often work in groups of two or more during class to discuss issues and share our perspectives.

8. My instructor expects us to provide evidence and/or reasons to support our positions.

9. My instructor demonstrates that it is important to challenge the evidence supporting ideas, not just the ideas.

10. My instructor is clear in stating objectives for the class at the beginning of lectures.

11. We are expected to reflect on concepts that we have previously read or discussed when addressing related and relevant material.

12. My instructor provides evidence and/or reasons to support the ideas that are presented in class.

13. My instructor helps us to recognize how the information we learn in class is applicable outside of the classroom.

14. My instructor expects us to think through complex ideas until we clearly understand course material.

15. My instructor teaches us that you cannot be certain about anything, it is just that some ideas are just supported with more evidence than others.

16. My instructor frequently asks us for feedback about classroom instruction and/or assessment.

17. My instructor often plans activities during class time which help us to think about class material.

18. My instructor generally encourages us to consider a number of perspectives on an issue, not just one.

19. My instructor would probably change his/her opinion about something if there was enough evidence against it.

20. We are encouraged to be organized and prepare for class by reading material in advance.

Appendix E

Delphi Report Characterizations of CT Dispositions and Related CEQ Items and related CCTDI scale category in brackets

Inquisitiveness with regard to a wide range of issues and *Concern to become and stay generally well informed* (Inquisitiveness)

1. We are encouraged to ask questions during class about class material or related topics.

2. My instructor presents information from a wide variety of relevant sources.

3. My instructor frequently recommends that we seek knowledge from sources other than the textbook.

Alertness to opportunities to use CT (Analyticity)

4. I am required to do more than memorize information for class, I am required to demonstrate an understanding of a variety of topics.

14. My instructor expects us to think through complex ideas until we clearly understand course material.

16. My instructor frequently asks us for feedback about classroom instruction and assessment.

17. My instructor often plans activities during class time that helps us to think about class material.

Self-confidence in one's own ability to reason (CT Self-confidence)

8. My instructor expects us to provide evidence and/or reasons to support our positions.

9. My instructor demonstrates that it is important to challenge the evidence supporting ideas, not just the ideas.

12. My instructor provides evidence and/or ideas to support the ideas that are presented in class.

Open-mindedness regarding divergent world views and *Understanding of the opinions of other people* (Open-mindedness)

6. My instructor addresses the differences between cultures with regard to some issues.

7. We often work in groups of two or more during class to discuss issues and share our perspectives.

18. My instructor generally encourages us to consider a number of perspectives on an issue, not just one.

Fair-mindedness in the appraisal of reasoning (Maturity)

5. My instructor encourages us to challenge the reasons that support our beliefs.

15. My instructor teaches us that you cannot be certain about anything, it is just that some ideas are supported with more evidence than others.

Willingness to reconsider and revise views where honest reflection suggests that change is warranted (Truth-seeking)

19. My instructor would probably change his/her opinion about something if there was enough evidence against it.

Diligence in seeking relevant information (Systematicity)

11. We are expected to reflect on concepts that we have previously read or discussed when addressing related and relevant material.

13. My instructor helps us to recognize how the information we learn in class is applicable outside of the classroom.

Care in focusing attention on the concern at hand (Systematicity)

10. My instructor is clear in stating objectives for the class at the beginning of lectures.

20. We are encouraged to be organized and be prepared for class by reading material in advance.

Appendix F

Focus Group Questions*

1. What types of classroom activities and assignments help you to think the most?

2. Do you believe that the size of your class is a factor in how well your instructor teaches you to think critically?

3. How do think that your instructors encourage you to think critically?

4. How do your classes vary in terms of instruction and format?

*This list is not inclusive of all questions asked; it represents a guide for the researcher. Questions were elaborated upon and extended when for student comprehension when necessary.

Appendix G

Brief Questionnaire for Instructors

For each of the following questions, instructors were asked to circle the appropriate response and/or use the space provided for written answers. Additional space was attached for optional comments or elaborations.

1. How would you define critical thinking?

_____
_____
_____
_____

2. How do you encourage your students to think critically?

_____
_____
_____
_____

3. Do you believe the material for this course lends itself well to assessment of critical thinking skills? Please specify why or why not. YES NO

_____
_____
_____
_____

4. Do you think that the size of your class is a factor in how well you can teach students to think critically? Please elaborate. YES NO

_____
_____
_____
_____

5. Have you had any formal training on teaching critical thinking or related topics? If yes, please list experience. YES NO

_____
_____
_____
_____

Appendix H

Consent Form for Students

The purpose of this research study is to look at how the instruction in your classes helps students to think critically. You will be asked to fill out a questionnaire prepared by the researcher. This questionnaire includes two sections, which assess: 1) your perceptions of the instruction in the classroom, 2) your tendency to think critically. You will also be asked to respond to several questions regarding your academic history. The entire questionnaire will take approximately half an hour to fill out. The questionnaires will marked by the researcher, and the results of this study will become part of an M.A. thesis.

Your participation in this study is voluntary, and you can withdraw from the study at any time. You will not be required to provide any explanation for ceasing to participate in the study. You may refuse to answer any question presented to you if you wish not to answer it in either part of the questionnaire. All of the data collected for this study will remain completely confidential, only the researcher will have access to this data. Your identity will not be associated with the questionnaire, and this signed form will be kept separate from the questionnaire. If you choose to participate in a focus-group session, you are not obligated to answer any question, and may leave at any time during the session without explanation. Your identity may be known to other members of the group, but your identity will not be associated with the results of this study. If the session is tape-recorded, the tape will be destroyed upon completion of the study in order to protect the anonymity of subjects involved in the session..

Your instructors will not have any access to the data from the questionnaire or the interview, and will not be informed of your participation in the study. Your refusal to participate in the study or decision to withdraw from the study will have no effect on your academic standing.

I have read and hereby agree to all of the above statements regarding my participation in this study.

Signature of participant _____

If you wish to have a summary of the results of this study mailed to you, please include your name and e-mail address:
Name: _____
E-Mail address:_____

If you do not have an e-mail address and wish to have the results of this study mailed to you, please include your home address:

_____

_____

Appendix I

Post-Secondary Experience Form

Name: _____

If you have ever attended another post-secondary institution, please indicate the name(s) of the institution(s), the number of years attended, certificate(s) or degree(s) achieved (if applicable) and academic major(s).

_____
_____
_____
_____
_____
_____

VITA

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University of Western Ontario	1991 to 1995
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Peckover, J. J. (1996). Children of divorce: Brief intervention techniques for school counsellors. The B.C. School Counsellor, 19, 3 -20.

Peckover, J. J. (1995). A Study of Generalized Self-Control Involving Effort. Thesis submitted in partial fulfilment for the degree of B.A. in Honours Psychology, University of Western Ontario.

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Title of Thesis:

A Study of Critical Thinking Dispositions and Instruction in Post-Secondary Institutions

Author [redacted]

Jennifer Peckover

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