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Critical Thinking Dispositions of Pre-service Teachers in Singapore: A Preliminary Investigation

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Abstract

Developing skills to think critically has become a catchphrase among many educators today. Many programs have been developed and employed in order to teach thinking skills. Strategies proposed range from teaching of these thinking skills directly or indirectly to a somewhat eclectic approach. Recently however, the notion of attitude has arisen and has since caught much attention among scholars in the field. It seems that more than just critical thinking skills, it is the individual's attitudes towards thinking that matter. The purpose of this study was to examine the effects of a thinking module on the critical thinking dispositions of the pre-service teachers. Dispositions towards critical thinking were measured using the California Critical Thinking Dispositions Inventory (CCTDI). A pre- and post-test quasi-experimental design was employed in this study. Results indicated that participants in the experimental group scored significantly higher in their CCTDI post-test. Implications of the results will be discussed in this paper.

Introduction

Being a skilful thinker in this new millennium is of paramount importance. A glance at the developments of information technology and the knowledge explosion phenomena would quickly convince us of the need to be skilful thinker. One can find almost ANY information known under the sun by means of the Internet with only a few keystrokes on personal computers. Upon finding the pool of information however, it is the individual's responsibility and challenge to differentiate between information nuggets and information garbage. One undeniably useful tool that could assist an individual in such venture will be none other than the much discussed critical thinking skills. Therefore, the next important task for us as educators is to instil these invaluable thinking skills into our students so that they are equipped to stay competitive in this challenging and rapidly changing world.

Critical thinking and the ability to think critically have become a catchphrase among educators today. Many educators have long advocated the teaching of critical thinking skills such as reasoning, skilful decision making, and problem solving. It probably dated way back to the time of John Dewey! Yet, we, as educators in this modern 21st century, are still grappling to understand the construct behind the science and/or art of teaching/promoting critical thinking skills among our students. What could possibly be amiss? Many scholars have dealt with this question from various perspectives, ranging from an affective approach to the cognitive approach. The other controversial issue is whether or not critical thinking should be taught as an independent course (the teaching of thinking approach) or within established courses (the teaching for thinking approach). No matter which approach is adopted, the classroom teachers will probably be the one feeling most pressurised due to the increased responsibilities of teaching thinking skills; in addition to their existing content teaching and classroom management.

Both approaches have their advantages and disadvantages. For instance, teaching thinking skills separately (i.e., the teaching of thinking approach) may not necessarily facilitate their application to content-area studies of real-life situations. Likewise, teaching thinking skills 'subtly' within the content instruction (i.e., the teaching for thinking approach) may not necessarily facilitate transfer either. Consideration of the advantages and disadvantages of both approaches will show us that the solution is not exclusively in either method. Instead, a unified approach to teach thinking skills would provide a framework for instruction in any field (Presseisen, 1988).

In addition, in the midst of all these issues, problem also arises when the mediators and agents of change in the classroom, i.e., the teachers, have been overloaded with administrative work and content teaching. With such backdrop in mind, I agree with Robert Swartz's infusion approach for teaching thinking skills simultaneously with content teaching in the classroom instruction (Swartz et al., 1994). With this infusion approach, only minimum (yet powerful) changes will be implicated in terms of the instructional planning for the teachers. The curriculum content consists of myriad of possibilities and a wonderful context for students to exercise and practice thinking skills.

The rationale for this study is that in order for teachers to be ready for such a great responsibility of teaching thinking skills in the classroom, they need adequate preparation. If one were to be a teacher of something, one has to be in the know for that something. Just as a teacher has to be trained extensively in their specialisation area (e.g., science or math), they also should be trained in thinking skills before expected to teach the same. One indication of such preparedness should be that the teachers show an improvement in their thinking skills as well as their disposition towards such thinking skills. As the development of thinking skills may take a longer period of time, the inclination towards such skills may appear earlier. In any case, it is with a certain inclination that one will do what one is inclined to do. In learning to drive for example, if one does not have any need and/or inclination towards becoming a driver, one will not see the need to learn the driving skill. Therefore, this study attempts to investigate the effects of a thinking module (which aims to teach teachers to teach thinking skills) on the critical thinking dispositions of pre-service teachers in Singapore. In this study, critical thinking dispositions were measured using the California Critical Thinking Dispositions Inventory (CCTDI) (Facione et al., 1994).

Critical Thinking Skills and Critical Thinking Dispositions

Of all the kinds of thinking that one can possibly identify, none has achieved greater attention from the educational community than critical thinking (e.g., McPeck, 1981; Ennis, 1985). The term critical thinking has become so prevalent in philosophy, psychology and education to the extent that it has become a 'buzzword'. For instance, critical thinking shapes goals in education prominently, whether among curriculum developers, educational researchers, parents, or employers (Potts, 1994). Norris (1985) in his 'synthesis of research on critical thinking' stated that "critical thinking is an educational ideal...it is not an educational option (and) students have a moral right to be taught how to think critically" (p. 44). However, the concept of critical thinking is not new.

The current critical thinking movement can be traced back to 1962 with Ennis' landmark article, 'A Concept of Critical Thinking'. Ennis' initial conception of critical thinking focused on

the correct assessment of statements based on criteria. It focused on the quality of the products of critical thinking, rather than the process. Specifically, twelve aspects of critical thinking have been identified: (1) Grasping the meaning of a statement; (2) Judging whether there is ambiguity in a line of reasoning; (3) Judging whether certain statements contradict each other; (4) Judging whether a conclusion follows necessarily; (5) Judging whether a statement is specific enough; (6) Judging whether a statement is actually the application of a certain principle; (7) Judging whether an observation statement is reliable; (8) Judging whether an inductive conclusion is warranted; (9) Judging whether the problem has been identified; (10) Judging whether something is an assumption; (11) Judging whether a definition is adequate; and (12) Judging whether a statement made by an alleged authority is acceptable.

These ‘quality-of-product-based’ conceptions of critical thinking were redefined approximately 20 years later incorporating a process of reasonable and reflective thinking focused upon deciding what to believe or do (Ennis, 1989; Norris & Ennis, 1989). Ennis’ new definition of critical thinking consists of three major parts. First, critical thinking starts as a problem solving process in a context of interacting with the world and other people. Second, it continues as a reasoning process, informed by background knowledge and previously acceptable conclusions, and it results in drawing a number of inferences through induction, deduction, and value judging. And finally, the critical thinking process ends in a decision about what to do or believe. Ennis’ new conception of critical thinking revolves around the ideas of general thinking skills, and dispositions toward critical thinking. A pictorial representation of Ennis’ critical thinking is shown in Figure 1.

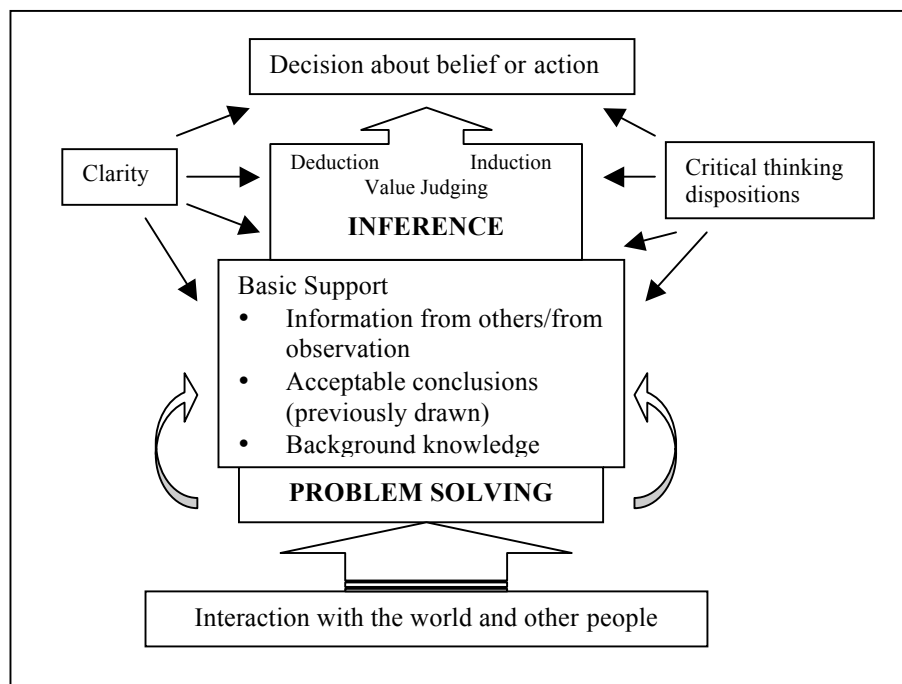


Figure 1: A Pictorial Representation of Critical Thinking
(taken from Norris & Ennis, 1989, p.6)

Ennis' taxonomy of general critical thinking skills can be summarised into 5 main aspects: (1) Elementary clarification; (2) Basic support; (3) Inference; (4) Advanced clarification; and (5) Strategies and tactics. Operating in the background of these critical thinking abilities are the elements of clarity and critical thinking dispositions (as shown in Figure 1). These critical thinking dispositions define the "critical spirit" (Norris & Ennis, 1989, p.11) of the thinker, and such critical spirit is what motivates the thinker to apply critical thinking skills to one's own thinking.

Swartz et al. (1994), like Ennis, has also adopted the definition of critical thinking as the evaluation of reasoning and argument as reasonable, reflective thinking directed at deciding what to believe or do. These critical thinking skills, according to Swartz, are frequently needed in our personal and professional life and they fall into two categories: (1) Skills related to *basic information* that we get from a variety of sources – determining the accuracy and reliability of sources, and (2) Skills related to *inferences* in which we draw conclusions that we do not verify directly from information offered as evidence to support them.

Many other leaders in the critical thinking movement have also formulated a variety of somewhat similar views. McPeck (1981) suggests that critical thinking could be defined as "a propensity and skill to engage in an activity with reflective scepticism" (p.8). Paul (1993) defines critical thinking as "disciplined self-directed thinking which exemplifies the perfections of thinking appropriate to a particular mode or domain of thinking" (p.33). Watson and Glaser (1980) define critical thinking as "a composite of attitudes, knowledge, and skills. This composite includes: (1) attitudes of inquiry that involve an ability to recognise the existence of problems, (2) knowledge of the nature of valid inferences, abstractions, and generalisations, and (3) skills in employing and applying the above attitudes and knowledge" (p.1). Beyer (1990) has a similar conception of critical thinking, defining it as willingness (a predisposition) and an ability to scrutinise and evaluate thinking in order to determine truth, accuracy, or worth, and to construct logical arguments to justify claims or assertions. Beyer's theory of critical thinking includes dispositions, criteria, argument, reasoning, and point of view.

Table 1: Critical Thinking Disposition (taken from Norris & Ennis, 1989, p.12).

Critical thinkers...	
1.	Seek a statement of the thesis or question
2.	Seek reasons
3.	Try to be well informed
4.	Use credible sources and mention them
5.	Take into account the total situation
6.	Keep their thinking relevant to the main point
7.	Keep in mind the original or most basic concern
8.	Look for alternatives
9.	Are open-minded and <ul style="list-style-type: none"> a) seriously consider points of view other than their own b) reason from starting points with which they disagree without letting the disagreement interfere with their reasoning c) withhold judgement when the evidence and reasons are insufficient
10.	Take a position and change a position when the evidence and reasons are sufficient to do so
11.	Seek as much precision as the subject permits
12.	Deal in an orderly manner with the parts of a complex whole
13.	Employ their critical thinking abilities
14.	Are sensitive to the feelings, level of knowledge, and degree of sophistication of others

All these definitions of critical thinking seem to have one main theme in common, i.e., critical thinking is a mental process that seeks to clarify as well as evaluate the action and activity that one encounters in life. It also seems that discussing these mental processes without mentioning thinking dispositions (i.e., willingness / inclinations) is an incomplete endeavour.

Thinking dispositions can be broadly defined as the tendencies toward particular patterns of intellectual behaviour. Ennis (1989) defines a critical thinking disposition in terms of the “critical spirit” (p.11) – which is a tendency to do something given certain conditions. Norris (1992) has similar views but states that critical thinking disposition is not simply a desire or predilection to thinking critically. He argues that individuals must either have formed habits to use certain abilities, or overtly think and choose to use the abilities they possess. A person with an ability to think critically under certain conditions will do it, only if so disposed. Table 1 summarises the conception of critical thinking dispositions put forward by Norris & Ennis (1989).

Paul’s definition of critical thinking also reflects the significance of dispositions. As mentioned earlier, his conception of critical thinking includes the “disciplined self directed thinking” (Paul, 1993, p.33), either ‘weak sense’ or ‘strong sense’ critical thinking, which serves to maintain interest and focus towards the issue at hand. For example, the characteristics of a ‘strong sense critical thinker’ are: (1) ability to question deeply one’s own framework of thought; (2) ability to reconstruct sympathetically and imaginatively the strongest versions of points of view and frameworks of thought opposed to one’s own; and (3) ability to reason dialectically (multilogically) in such a way as to determine when one’s own point of view is at its weakest, and when an opposing point of view is at its strongest. Awareness of one’s own biases, misconceptions, prejudices, and willingness to critique then is of high value in Paul’s conception of critical thinking. Swartz et al. (1994), in his treatment of thinking skills, also postulates that critical thinking involves important attitudes and dispositions. For example, critical thinkers search for reasons by being open-minded, willing to suspend judgement if they fail to find reasons to support or counter an idea, willing to change their minds when new evidence is found, and etc.

In a similar spirit, Peter and Noreen Facione, authors of the California Critical Thinking Dispositions Inventory (CCTDI), define critical thinking dispositions as a constellation of attitudes, intellectual virtues, and habits of mind (Facione et al., 1994). This definition of critical thinking was developed as a product of a Delphi research project involving 46 experts in thinking. The definition characterises critical thinking as purposeful and self-regulatory judgement. The CCTDI was formulated from the characteristics of ‘the ideal critical thinker’ presented in the 1990 Delphi consensus statement:

The ideal critical thinker is habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, 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 (Facione et al., 2000, p. 1).

The seven characteristics of an ideal critical thinker (i.e., critical thinking dispositions) are: (1) open-mindedness – tolerance of divergent views, self-monitoring for possible bias; (2) analyticity - demanding the application of reason and evidence, alert to problematic situations, inclined to anticipate consequences; (3) truth-seeking – courageous desire for the best knowledge, even if such knowledge fails to support or undermines one's preconceptions, beliefs

or self interests; (4) cognitive maturity – prudence in making, suspending, or revising judgement; (5) systematicity – valuing organization, focus and diligence to approach problems of all levels of complexity; (6) inquisitiveness – curious and eager to acquire knowledge and learn explanations even when the applications of the knowledge are not immediately apparent; and (7) critical thinking self confidence – trusting one's own reasoning skills and seeing oneself as a good thinker. These seven characteristics are featured in the CCTDI as seven factors measuring the degree of critical thinking dispositions.

From a theoretical point of view, it is also speculated that a linear relationship exists between critical thinking and its dispositions (e.g., Ennis, 1982; Paul, 1995; Norris, 1985). Facione et al. (1995) state that the study of dispositions in relation to critical thinking has just begun, and a number of empirical studies are needed to robustly examine the relationship. An exploratory research done in Singapore on the critical thinking disposition of Malay students also shows that critical thinking disposition is related to cognitive factors such as general academic ability and critical thinking ability (Abdullah, 1999). A linear relationship between critical thinking and its dispositions seems to suggest that teaching for critical thinking must address the attitudinal and dispositional aspects of critical thinking, as well as the skills and abilities in good judgement that critical thinking involves.

The Study

In order to investigate the critical thinking dispositions of the pre-service teachers, a quasi-experiment pretest-posttest design was adopted in this study. Twenty-nine pre-service teachers have participated in this preliminary investigation; i.e., fifteen in experimental and fourteen in control group. Quasi-experimental method is used because the random assignment of participants into the two conditions (experimental and control) is not possible. The California Critical Thinking Dispositions Inventory (CCTDI) developed by Facione and Facione (2000) was used to measure critical thinking dispositions. The inventory was given at the beginning and the end of the thinking module. Subjects were to response to each item in the CCTDI by strongly agreeing or strongly disagreeing with the statements given. The CCTDI is a 6-point Likert scale. They received 6 points for an item if they strongly agreed or 1 point for that item if they strongly disagreed. Each of the seven disposition scores (truth-seeking, open-mindedness, analyticity, systematicity, critical thinking self-confidence, inquisitiveness, and cognitive maturity) was compared at the beginning and end of the thinking module.

The rationale of this study is deeply rooted in the idea that teachers are the key change-agent in producing a thinking generation. If teachers are going to be the mediator and change-agent in the classroom, and the change element that is being concerned here is the thinking skills, it will be very important for us to find out whether teachers are adequately prepared for teaching the said skills in the classroom context. One indicator is that the teacher must show some evidence of changes within themselves. One of the indicators, and probably the most evident one will be of their attitude towards thinking itself. Therefore the research question employed in this study was: what are the effects of a thinking module on the critical thinking dispositions of pre-service teachers?

Thinking experts also suspect that there exists a relationship between thinking skills and thinking disposition. If there are any changes in thinking dispositions, logically there already exist changes, or at least potential for changes, in their thinking abilities. Attempts were also

made to find out the relationship between critical thinking skill and critical thinking disposition. In this case, critical thinking abilities as measured by the Watson Glaser Critical Thinking Appraisal (WGCTA) is considered as independent variable.

The Results

Results from this preliminary study show that subjects who had been exposed to the thinking module have attained a higher score at the CCTDI post-test. According to Facione and Facione (1994), scores of 40 or above in any of the seven scales are indicative of a positive tendency towards that disposition. Scores between 50 and 60 suggest a strong positive tendency towards that disposition. In contrast, scores of 30 or below are considered as having a negative tendency towards the disposition. Scores in the mid range of 31 to 39 indicate ambivalence of a mixed tendency on a given scale.

The pre-test scores indicated that the pre-service teachers in the experimental group have positive disposition in the areas of inquisitiveness, analyticity, and critical thinking self-confidence (see Table 2). For the control group, the pre-service teachers only showed a positive disposition in the area of inquisitiveness. A post-test on the pre-service teachers' CCTDI scores showed that those in the experimental group have positive disposition in four areas: inquisitiveness, analyticity, critical thinking self-confidence, and cognitive maturity. Scores in the control group remained the same.

Table 2
Means, Standard Deviations, and Mean Differences for Pre-Test and Post-Test on CCTDI

	Experimental					Control				
	Mean pretest	SD	Mean posttest	SD	Mean Diff	Mean pretest	SD	Mean posttest	SD	Mean Diff
Overall CCTDI	279.20	21.93	288.14	24.78	8.94	262.67	27.59	259.15	32.74	-3.52
Truth-seeking	32.80	4.42	33.36	5.15	0.56	33.00	5.69	32.00	6.75	-1.00
Open-mindedness	38.20	3.61	39.36	4.78	1.16	38.00	5.36	37.54	4.58	-0.46
Analitycity	44.10	5.00	44.43	5.20	0.33	38.83	4.49	38.15	4.47	-0.68
Systematicity	37.80	3.08	38.14	4.67	0.34	35.75	4.73	36.62	5.88	0.87
CT Self-Confidence	42.40	8.09	43.57	7.30	1.17	36.08	6.42	38.08	7.45	2.00
Inquisitiveness	45.30	7.70	48.14	6.18	2.84	41.58	4.80	40.62	6.50	-0.96
Cognitive Maturity	38.60	6.22	41.14	7.00	2.54	39.42	5.63	36.15	8.22	-3.27

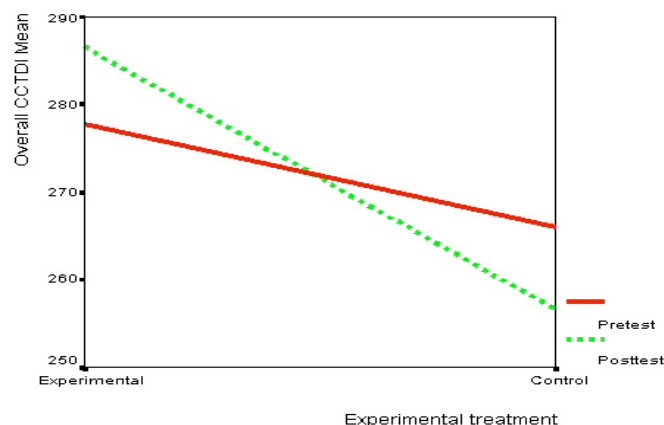


Figure 2: Treatment by Overall Pretest-Posttest for CCTDI

An independent t-test performed showed that the pre-service teachers who were exposed to the thinking module produced a significantly higher overall CCTDI posttest scores at level $p < .05$. The sub-scale of analyticity and inquisitiveness had also achieved a significant difference (see Table 3 for details). Figure 2 showed that the overall posttest CCTDI score for the experimental group was higher compared to the control group.

Table 3
Independent t-Test for Scores on CCTDI

	t-test for Equality of Means						
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
Overall CCTDI	2.606	25	.015	28.99	11.12	6.08	51.90
Truth-seeking	.590	25	.560	1.3571	2.2997	-3.3791	6.0934
Open-mindedness	1.008	25	.323	1.82	1.80	-1.90	5.53
Analitycity	3.350	25	.003	6.27	1.87	2.42	10.13
Systematicity	.750	25	.460	1.53	2.04	-2.67	5.72
CT Self-Confidence	1.934	25	.065	5.49	2.84	-.36	11.35
Inquisitiveness	3.086	25	.005	7.53	2.44	2.50	12.55
Cognitive Maturity	1.701	25	.101	4.99	2.93	-1.05	11.03

The relationship between critical thinking dispositions and critical thinking skills was also being examined. The pre-service teachers' critical thinking abilities were measured using the WGCTA. Table 4 showed the correlation (Pearson) between \critical thinking abilities (as measured by WGCTA at the posttest) and CCTDI (both pretest and posttest).

Table 4
Pearson Correlations for Total Scores of WGCTA and CCTDI

	CCTDI Pretest	CCTDI Posttest
WGCTA	.550*	.542**

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Discussion

The results from this preliminary investigation allowed for some useful implications. Firstly, the most obvious implication is that critical thinking disposition, and thus a general thinking disposition can be improved through purposeful courses/modules. Secondly, critical thinking dispositions can be improved among the adults. The age group of pre-service teachers who participated in this study were between 20-28 years old. The implication is that it is never too late to improve thinking dispositions. Thirdly, critical thinking disposition can be improved in a relatively short period of 10-week module. This is exciting because it seems that busy as they are, the teachers in Singapore can be equipped in their short time of pre-service as well as in-service training in order to prepare them for teaching thinking skills in the classroom context.

Another implication from this simple preliminary study is that the content of the thinking module may provide some useful information regarding what are the important topics and issues to be included in any thinking module so that teachers will be reasonably prepared to teach thinking skills in the classroom. Looking into the rationale behind of the module, certain theoretical aspects should be included to ensure such critical thinking improvement (Chye, Kong, & Seng, 2001) among pre-service teachers. Among others, the elements are: attitudes towards teaching thinking skills in the classroom; dispositions towards thinking skills; knowledge about thinking skill and its relationship towards learning; and teaching skills and techniques for creating thoughtful classrooms.

Based on the results of this preliminary study, the disposition of inquisitiveness seems to be the most stable characteristic. Inquisitiveness (as in the CCTDI) measures “intellectual curiosity” and the “intention to learn things even if their immediate application is not apparent” (Facione & Facione, 1994, p.12). Both experimental and control groups seem to have a positive inclination towards this disposition.

The results of this preliminary study may not be able to be generalised to the whole population of pre-service teachers in Singapore due to the nature of the small sample size. The improvement in critical thinking disposition however, can have a far-reaching impact because as these twenty-nine teachers disperse throughout Singapore, they could help provide a rippling effect that move the nation towards a thinking nation. If critical thinking disposition is an indication towards thinking critically, the teachers already have a good start on their road to become the key agent to teach thinking skills in the classroom context.

Conclusion

Dispositions drive action and lead to a certain level of constancy of behaviour across circumstances (Ritchart, 2000). For critical thinking, Facione et al. (2000) have suggested seven distinct characteristics: i.e., truth-seeking, open-mindedness, analyticity, systematicity, critical thinking self-confidence, inquisitiveness, and cognitive maturity. These traits are more than just abilities. They reflect one’s inclination to act in a certain way and one’s sensitivity to occasions when it is appropriate to do so. If the disposition, and not just thinking skill, to think in a certain way is to be developed, then teachers’ action must convey that such thinking is highly valued in the classroom. Furthermore, it is also a well-known fact that students tend to imitate their teachers in their intellectual development.

In summary, critical thinking dispositions of the pre-service teachers who have been exposed to the thinking module can be improved and thus such inclination towards critical thinking can cause the teachers to be more critical in their approach whether within their academic reasoning or everyday reasoning. This everyday reasoning includes the ability to tackle classroom problems or issues not only in terms of academic problem but also classroom management problems.

References

- Abdullah, K. (1999). Critical thinking disposition of Malay Singaporean students. In A.S.C. Chang, S. Gopinathan, & W.K. Ho (Eds.), *Growing Up in Singapore*. Singapore: Prentice Hall.
- Beyer, B.K. (1990). What philosophy has to offer to the teaching of thinking. *Educational Leadership*, February, 55-60.
- Ennis, R.H. (1985). A logical basis for measuring critical thinking skills. *Educational Leadership*. 43(2), 44-48.
- Ennis, R.H. (1989). Critical thinking and subject specificity: clarification and needed research. *Educational Researcher*, 13, 13-16.
- Facione, P.A., & Facione, N.C. (1994). *The California Critical Thinking Skills Test: Test Manual*. Millbrae, CA: California Academic Press.
- Facione, P.A., Facione, N.C., & Giancarlo, C.A.F. (2000), *The California Critical Thinking Disposition Inventory: Test Manual*. California: California Academic Press.
- Facione, P.A., Sanchez, C.A., Facione, N.C., & Gainen, J. (1995). The dispositions toward critical thinking. *Journal of General Education*, 44(1), 1-24.
- McPeck, J.E. (1981). *Critical Thinking and Education*. Great Britain: Martin Robertson & Company Ltd.
- Norris, S.P. (1985). Synthesis of research on critical thinking. *Educational Leadership*, 42, 40-45.
- Norris, S.P. (1992). *The Generalizability of Critical Thinking: Multiple Perspectives on a Educational Ideal*. New York: Teachers College.
- Norris, S.P., & Ennis, R.H. (1989). *Evaluating Critical Thinking*. Pacific Grove, CA: Critical Thinking Press & Software.
- Paul, R. (1993). *Critical Thinking: What Every Person Needs to Survive in a Rapidly Changing World*. Santa Rosa, CA: Foundation for Critical Thinking.
- Paul, R. (1995). *Critical Thinking: How to Prepare Students for a Rapidly Changing World*. Santa Rosa, CA: Foundation for Critical Thinking.
- Potts, B. (1994, February). Strategies for teaching critical thinking, *ERIC Digest*, ED385606.
- Preseisen, B. (1988). Avoiding battle at curriculum gulch: teaching thinking and content. *Educational Leadership*, 45, 7-8.
- Ritchart, R. (2000). Mental models, instructional values, and the development of students' intellectual character: A tale of two teachers. *Harvard Project Zero*, Paper presented at the America Educational Research Association (AERA).
- Swartz, R.J. & Parks, S. (1994) *Infusing Critical and Creative Thinking into Content Instruction: A Lesson Design Handbook for the Elementary Grades*. Pacific Grove, CA: Critical Thinking Press & Software.
- Watson, G., & Glaser, E.M. (1980). *Watson-Glaser Critical Thinking Appraisal: Manual*. USA: The Psychological Corporation.