An Examination Of The Effects Of A Process-Based Thinking Model On Comprehensive Reflective Thinking

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Abstract

The purpose of this research is to examine the result of the process-based thinking model conducted in a workshop on the Comprehensive Reflective Thinking (CRT) of university students. The method of research was experimental with the use of control and experimental groups. The research included pretests and posttests. The statistical population was comprised of students from the University of Sistan and Baluchestan (USB). The subjects were selected randomly from voluntary students who were matched in the two experimental and control groups. The students of experimental group participated in a ten-session workshop. The instrument used for gathering the data was a Comprehensive Reflective Thinking Scales (CRTS). Statistical analysis was conducted by the analysis of covariance method. Results show that the CRTS scores for the experimental group were significantly higher than the CRTS Score for the control group. There were no significant differences between the CRTS scores of boys and girls.

Keywords: Thinking, comprehensive, reflective, process-based thinking model, and student.

Introduction

Studies indicate that students’ thinking abilities can be enhanced through direct instruction (Worsham and Stockton, 2008). For example, Plath, English, Connors and Beveridge (1999) study showed that teaching critical thinking skills improved the critical thinking abilities of social work students and assisted them to identify principles of critical thinking. Kazemi (2000) indicated that reflective thinking of secondary school students was improved by using of “problem solving method of teaching” in the social studies classes. Osburn and Mumford (2006) reported that training in the application of effective strategies promoted the creative problem-solving skills of students. Generally, Zhang (2008) showed a mutual effect between the teaching ability of instructors and student development.

A number of studies tried to suggests effective programs or models for the enhancement of thinking skills (De Bono, 1972, 1999, Allegretti and Frederick, 1995, De Corte, Verschaffel and Masui, 2004, Mazer, Hunt, and Kuznekoff, 2008). However, Gleavey (2006) maintains that over the past decades, there is no clear evidence to support the effectiveness of these special thinking skills programs that developed to improve thinking and Mazer, Hunt, and Kuznekoff (2008) argue that future research should concentrate on enhancing the critical thinking of students.

In spite of the position that argues the concept of reflective thinking is not clear (Husu, Toom and Patrikainen, 2008) and it is difficult to formulate thinking because by thinking we experience in various ways that require different formulations of thinking (Glevey, 2006); there is a generalist position that maintains that thinking in different experiences is evoked by facing to a problem and continues through resolving the problem by available information and it make no difference whether the problem is about sending a rocket into space or riding a bicycle.

Along similar lines, this process of thinking involves all kinds of concepts that refer to thinking. That is, all types of thinking concepts pass through similar stages in the following way: 1) clarifying a problem, 2) information gathering, 3) proposing a hypothesis, and 4) an examination of the hypothesis (Dewey, 1933, Smith and Hullfish, 1992, Shariatmadari, 1995, Sternberg, 1989 and Kazemi, 2000a). Therefore reflective thinking involves creative thinking, critical thinking, decision making and so on.

The definition of the CRT used for the purposes of this study is the one used by Yahya Kazemi in his Ph.D. dissertation. Kazemi (2000a: 20) defines reflective thinking as “an attempt to clarify a problem, seeking information and finding a reasonable and comprehensive relationship among the separated pieces of information by reorganizing them via the use of fantasy to create a hypothesis”. This definition is focused on the process of thinking and the best outcome of this process is a hypothesis that explains comprehensive relationships. In this definition, finding the comprehensive relationship expands reflective character of thinking.

In this study, a process-based thinking model was created to improve the Comprehensive Reflective Thinking (CRT) skills of students. This model and the scale used in this study are based on the following theoretical framework.

**An outline of the process-based thinking workshop evaluated in the study**

The workshop was conducted in ten sessions. In each session, students practiced one of the problem solving stages. The guidelines of this process-based thinking workshop have been outlined in the following stages:

- **Motivational lecture**: what is the importance of thinking in terms of scientific, economic, social and historical development? Why do some people use fewer thinking skills? How do we enforce thinking?
- **Thinking, with the aim of clarifying the stages of thinking**: How does thinking begin? How is a problem resolved? How is a resolution approved?
- **Changing the use of fantasy to guessing**: A) write 10 sentences that are impossible. B) Fill the unfinished sentences, rationally and realistically.
- **Thinking, with the use of the Hypothesis Making Tools (HMT)**: write all the possible resolutions to the presented problems. Use Brain Storming (Lumsdaine and Lumsdaine, 1995: 198, Torrance, 1993: 46), Loud Thinking (by writing) and Considering a Sample when thinking (Kazemi, 2000a: 112) tools.
- **Thinking, with the aim of choosing the best hypothesis**: give all of possible resolutions to the presented problems, then chose the best one by ranking the resolutions.
- **Thinking, with the aim of using the Information Gathering Tools (IGT)**: use PMI (Plus, Minus and Interesting Points), OPV (Other People’s Views) and C&S (Consequence and Sequence) tools (Maclure and Davies, 1989) when thinking about critical problems like “what do you think about paying to study in public universities?”
- **Thinking, with the aim of clarifying a problem**: write all the problems you know of, and then choose the most important one by using the IGT.
- **Thinking, with the aim of clarifying and dividing the emotional impacts**: with your different problems, how can you separate the emotional effect from rational thinking? Chose the best proposition offered from the group and try it in real situations (after the session).
- **Thinking, with the aim of combining the different stages of thinking**: A) Write all your local cultural problems and then choose the most important one by using the IGT. B) Write all the possible resolutions to the chosen problem by using the HMT, and then choose the best resolution.
- **Thinking**: individually, write down all your private problems and then choose the most important one by using the IGT. Write all the possible resolutions to the chosen problem by using the HMT, and then choose the best resolution.
This study investigated the effect of the workshop, based on processed-based thinking model on the CRT (Comprehensive Reflective Thinking) skills of students.

**Methodology**

To increase the accuracy of the CRT model, it was conducted on 18 students similar to the subjects, as a pilot study. The main study employed a pretest and posttest experimental design with an experimental group and a control group. The subjects were matched in two groups according to their results in the pretest of Comprehensive Reflective Thinking Scales (CRTS). These were administered to 68 volunteer students when they enrolled for the workshop. Each group was assigned randomly to control or experimental group. Only the students in the experimental group participated in the workshop. The workshop ran for twenty hours over three weeks (ten sessions). During this time the control group was waiting for the next workshop. Post-tests using the CRTS were administered at the end of the workshop for both groups. Results of the experimental and control groups were compared using the statistical method of analysis of covariance (ANCOVA).

The statistical population consists of 21217 undergraduate and postgraduate students of University of Sistan and Baluchestan (USB). The sample was comprised of 40 subjects that were selected randomly from 68 volunteer students. The volunteer students were females and males from various fields of study.

The Research instrument used in this research was the Comprehensive Reflective Thinking Scale (CRTS). This instrument contains three scales: 1) fluency or the total number of ideas (in scoring, one point is given for each idea or reason), 2) flexibility or the number of categories or themes in the ideas, (in scoring, one point is given for each category from which the ideas or reasons are extracted), 3) creditability or the number of reliable ideas (in scoring, one point is given for each reliable idea). Kazemi (2000a: 123) reported that formal validity of the questions was confirmed by three educational experts. Validity and reliability was also achieved by the Factor Analysis so that six questions remained out of the eight. For these six questions the coefficient of Coronbach alpha reported was .71. In the present study the alpha was .72 (N= 65, Items= 6). To increase reliability of this open-answer test, the scoring is executed by 3 examiners that the correlations among their scoring were r = .65, .68 and .73 (sig. = 000).

**Results**

Results of the CRTS of experimental and control groups were compared by ANCOVA, outcomes summarized in Table 1, below.

*Table 1: Summarized results of the changes obtained by effects of the workshop on the CRTS of students*

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
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<td>2837.266</td>
<td>1</td>
<td>2837.266</td>
<td>11.212</td>
<td>.002</td>
<td>.243</td>
</tr>
<tr>
<td>Pretest</td>
<td>5306.989</td>
<td>1</td>
<td>5306.989</td>
<td>20.972</td>
<td>.000</td>
<td>.375</td>
</tr>
<tr>
<td>GROUP</td>
<td>1176.831</td>
<td>1</td>
<td>1176.831</td>
<td>4.650</td>
<td>.038</td>
<td>.117</td>
</tr>
<tr>
<td>GENDER</td>
<td>1.336</td>
<td>1</td>
<td>1.336</td>
<td>.005</td>
<td>.942</td>
<td>.000</td>
</tr>
<tr>
<td>GROUP * GENDER</td>
<td>1331.946</td>
<td>1</td>
<td>1331.946</td>
<td>5.263</td>
<td>.028</td>
<td>.131</td>
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<tr>
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</tr>
<tr>
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<td>185694.000</td>
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<td></td>
<td></td>
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</tr>
</tbody>
</table>

R Squared for the groups, gender, and their interaction = .230 (Adjusted R Squared = .166). Dependent Variable: posttest of the CRT
Table 2 shows that there is a significant difference between the CRTS scores of the control and experimental groups, \( R(1, 35) = 4.6, \text{MSE} = 1176.83, p \leq .05. \) That is, the mean score of changes for the experimental group, \( M = 15.2, Sd = 17.8, \) is significantly higher than the mean score of changes for the control group, \( M = 2.8, Sd = 14.7. \)

Table 2 also reveals that in general, the mean square of change of the CTRS scores for males and females is not significantly different, \( R(2, 21) = .005, \text{MSE} = 1.34. \) But the interaction of gender within groups exhibits a significant difference \( F(1,35) = 5.26, \text{MSE} = 1331.95, p \leq .05. \) When comparing gender within the two groups, the mean scores of change of the CTRS for males in the experimental group, \( M = 18.9, \) are significantly higher than for males in the control group, \( M = -2.4. \) The mean score of change of the CTRS was 10.8 for females in the experimental group and 10.4 for females in the control group.

When using the Adjusted R Squared method the results show that .166 of the CRTS variance is predicted by the group’s gender and their interaction.

**Discussion**

This study examined the effectiveness of a process-based model on the CRT skills of university students. The model was used in a workshop that lasted ten sessions. The results of this research revealed significant improvements in students' CRT skills in the experimental group compared with the students in the control group. In other words, the process-based model enhances the CRT skills of students.

These findings support the results of other studies which demonstrated that the thinking ability of students can be improved through direct instruction (Plath, English, Connors and Beveridge, 1999, Kazemi, 2000 b, Osburn and Mumford, 2006, Worsham and Stockton, 2008 and Generally, Zhang, 2008). The previous researches did not clarify their theoretical foundations about thinking skills (De Bono, 1972, De Bono, 1999, Halton, Murphy and Dempsey, 2007, Toulmin, Rieke, and Janik cited by: Allegretti and Frederick, 1995, De Corte, Verschaffel and Masui, 2004 and Mazer, Hunt, and Kuznekoff, 2008). They used chaotic models and studied fractional skills. On the other hand, the model used in this research is based on a rational framework that is approved by some great educational philosophers like Dewey (1933), Smith and Hullfish (1992), Shariatmadari (1995) and Sternberg (1989). These findings show that the theoretical process of thinking is one of the main sources for developing practical skills that improve CRT skills.

Another finding in this study shows that in general, changes in the CTRS scores for males and females were equal. Nevertheless, the interaction of gender and groups showed that the mean of change in the CTRS scores for males of the experimental group are higher than that for males of the control group. But the mean of change in the CTRS scores for females in the experimental group was equal to females in the control group. This finding revealed that the CTRS scores of females showed a substantial increase even in the control group. The latter result supports Gilstrap and Duprees’ (2008) findings and, also, Tripp and Woods’ (cited by Gilstrap and Dupree, 2008) argument that often female students are more comfortable with reflective and critical thinking than their male counterparts.

**Conclusion**

In this study we found that the process based thinking model can be an effective means for improving the CRT (Comprehensive Reflective Thinking) skills of students. However the CRT instruction should not be limited to a workshop and “this vital instruction should expand to content areas throughout students' academic careers” (Mazer, Hunt, and Kuznekoff, 2008).

**References**


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1 In keeping morality observations, the students of control group were participated in a similar workshop after conducting the research.