School Thinking Programme and Its Impact on Student Creative Thinking and Academic Achievement: A Perspective

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Abstract

Creative intelligence is recognised as an important element for economic survival in New World Order. Hence, the need to develop and nurture creative thinkers has become a national priority in many school systems. But schools give greater importance to academic achievement as they are judged by the academic performance of their students. This study is a preliminary attempt to investigate whether a relationship exists, if any between the creative personality of individuals and their achievement in a number of school subjects. “How do you think” Form E Inventory by Davis was used for this purpose. The results indicate that creativity provides a small but positive value-added benefit to academic achievement. Implications for teaching are discussed.

Introduction

The need to develop and nurture creative thinkers is now a national priority in Singapore. This is so as to fulfil both the educational and economic needs of the country in the future. It is felt that the key source of economic growth in the knowledge-based economy will depend on its citizens being imaginative and having the ability to bring out new ideas and apply them to activities in every walk of life. This new direction in education is encapsulated in the vision, Thinking Schools, Learning Nation (Goh, 1998). The Singapore Ministry of Education spearheaded this movement by implementing a number of initiatives in the schools. Among the initiatives is the emphasis on the development of students’ critical and creative thinking together with the use of IT in the teaching-learning process. To facilitate the successful implementation of these initiatives, efforts are underway to reduce the content of the curriculum by 30% to give sufficient time for students to engage in self-initiated learning. It is hoped that in this manner, the students can be empowered to learn by themselves and come out with creative ideas in the learning tasks assigned. It is also envisaged that this educational strategy, would generate thinking and committed citizens to keep Singapore vibrant and successful in the future.
What exactly is creativity? Sternberg and Lubart (1995) believe that creativity, like intelligence, is something that everybody possesses in some amount but it is not a fixed attribute. Also, people differ widely in the extent to which they realise that potential. People tend to be creative in certain domains but not in others. Most people are found to be above average in at least some domains but below average in others. Hence, creativity is considered as a construct that "tends more towards domain specificity than towards domain generality" (p. 22). Researchers in this area also recognise creativity as a multi-faceted construct. Creative thinking is usually defined as a kind of person, process, product and an environmental press. Rhodes (1961) referred to these four kinds of definition as the "Four P's of creativity" — Person, Process, Product and Press. Torrance (1996) prefers the process definition for the following reason:

"If we define creativity as a process, we can then ask what kind of person one must be in order to engage most successfully in the process, what kind of environment one needs in order to function most successfully and what kind of products result from the process". (p. 72)

In the process definition, the thinking aspect is highlighted. Bartlett (1958) indicates that creative thinking involves adventurous thinking, getting off from the main track, breaking out of the mould, expressing different points of view, and looking at problems from a different angle. It involves a mental leap from the stimulus to the response. Barchillon (1961:68) says that the thinking process involved in creation are of two kinds: "cogito, to shake and throw things together; and intelligo, to choose and discriminate from many alternative possibilities and then synthesize and bind together elements in a new and original way". Those who emphasise on the product go for the quality of the product. Thurstone (1952) and Steward (1950) are of the view that an act is creative if the thinker feels that he has created something novel irrespective of whether the society regards the idea as novel. But Stein (1953) disagrees with this view as he believes that "novelty" or "newness" means that the creative product did not exist previously in the same form. Stein believes, however that it may, involve reintegration of existing materials or knowledge, though it must contain some new elements. According to Sternberg and Lubart (1995), a product can be described as creative only when it is novel and appropriate. They feel that these two elements are necessary for creativity.

From the perspective of the "person" factor, creative people are considered to have certain dispositions. Some qualities attributed to a person who is highly creative are the willingness to take sensible risk, perseverance in the face of obstacles, tolerance for ambiguity, ability to maintain direction and task focus, open to experiences, nonconforming, unorthodox, and high energy (Sternberg & Lubart, 1995).
Environment is another factor that influences creative output. Some environments nurture creativity, others squelch it. An environment rich in stimuli encourages creativity more than an environment that is barren and bare. Sternberg and Lubart (1995) are of the opinion that

"Creativity is in part the product of interaction between a person and his/her context. A setting that stimulates creative ideas, encourages them when presented, and rewards a broad range of ideas and behaviours will surely foster original and non-conformist thinking." (p. 10)

They are also of the opinion that people should know the extent of their freedom to create as it facilitates creativity.

Why is there a need to develop creative thinking? Torrance (1995) is of the view that creative thinking contributes to the acquisition of knowledge and could be as important as memory and other intellect functions. Getzels (1958) compared high school students in the upper 20% on creativity but not in the upper 20% on IQ with students in the upper 20% on IQ but not in the upper 20% on creativity. Although there was a 23-point difference in IQ scores between the means of the two groups, there was no difference in achievement as measured by standardised tests. Besides, creative thinking is essential in the application of knowledge to daily personal and professional problems. According to Sternberg and Lubart (1995, p. 10), "Creativity is the spring that propels technology, cultural, financial, intellectual and certainly personal leap". Sternberg (1996) in his research over the years, has identified three types of intelligence that would best serve as predictors of success in the real world, namely academic/analytical, creative and practical intelligence. Among these, creative intelligence is recognised as the intervening spark that helps to link the knowledge and skills learned in one form and context by a person to the problem faced in another form and context.

In line with this thinking, there is an effort on the part of the Ministry of Education, Singapore to give greater emphasis to the cultivation of creative and critical thinking skills by adjusting the school curriculum. However, schools and teachers are asked at the same time to ensure that our pupils retain the mastery of core knowledge and concepts. Hence, in the final analysis it is apparent that the school, the teachers and pupils are judged on the basis of academic performance. Teachers therefore are more likely to be inclined to consciously promote creative thinking in their teaching if there is some evidence to show that emphasis on the cultivation of creative thinking provides value-added benefits towards academic achievement in the Singapore context.

Tan (2000) did a review of the study of creativity in Singapore and came to the conclusion that creativity has yet to become a significant research theme in Singapore. Hence, this study was initiated to investigate whether the thinking programme implemented in schools has an impact on the development of creative thinking and academic achievement in school subjects. The main objectives of this study were to find answers to the following research questions:
(i) Is there a difference in creativity of students who had undergone the thinking programme and those who were not exposed to it?

(ii) Is there a positive, significant relationship between creativity and achievements in school subjects (English, Mathematics, Science, Geography and overall academic achievement)?

(iii) Is there a difference in achievements in school subjects (English, Mathematics, Science, Geography and overall academic achievement) of pupils who had undergone the thinking programme and those who were not exposed to it?

**Methodology**

**Sample**

Students from two intact Secondary Two classes and three intact Secondary Three classes in a secondary school participated in this study. It was an opportunity sample. The school is a neighbourhood school that draws its students mainly from Bedok and the surrounding Housing and Development Board (HDB) estates. Most of these students come from low middle class families. In terms of the academic ability of the sample, their Primary School Leaving Certificate (PSLE) mean aggregate score is about 200. The mean age of the Secondary Two students was 13 years and 11 months \(N=73\) and that of the Secondary Three students was 15 years and 3 months \(N=107\). The mean age of the sample as a whole was 14 years and 9 months \(N=180\). The characteristics of the sample in terms of gender and grade level are shown in Table 1.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>80 (44.4%)</td>
</tr>
<tr>
<td>Female</td>
<td>100 (55.6%)</td>
</tr>
<tr>
<td>Total</td>
<td>180 (100%)</td>
</tr>
<tr>
<td>Secondary Two</td>
<td>73 (40.6%)</td>
</tr>
<tr>
<td>Secondary Three</td>
<td>107 (59.4%)</td>
</tr>
<tr>
<td>Total</td>
<td>180 (100%)</td>
</tr>
</tbody>
</table>

**The Thinking Programme in Singapore Schools**

The thinking programme is taught over a two-year period to lower secondary students. The objectives of the thinking programme are to enable students to:
• acquire and understand the core thinking skills and the processes involved in using them
• apply these skills in the learning of content subjects and in real-life decision making and problem solving situations
• develop positive habits, which would help them become critical, creative and self-regulated thinking learners.

The programme is currently being introduced to lower secondary classes in stages. Teachers and Heads of Department had undergone training to implement the programme in the school. The programme in the participating school started in January 1999 with Secondary One pupils. In 2000, both Secondary One and Two students were involved in the programme. At the time of the data collection, the students in Secondary Two had undergone one and a half years of training in thinking skills, whereas the Secondary Three students had not been exposed to any formal thinking skills programme. The Thinking Programme consists of one period per week of explicit teaching of thinking skills. In addition, all subject teachers are expected to utilize about 30% of curriculum time to infuse thinking skills into the core subjects of English, Science, Mathematics, Geography and History.

**Measures**

**a. Creativity personality trait**

The creativity personality trait was measured using the “How do you think” (HDYT) Form E inventory by Davis (1977). The HDYT inventory assesses attitude, motivations, interests, beliefs and other personality characteristics that are strongly suspected to underlie creativity behaviour. The Form E inventory consists of 100 items in the form of a five-point Likert scale with a reported reliability coefficient of .94 and validity coefficient of .42 (Davis, 1975). This measure was selected for use in this study because Quah and Teo (1998) pilot tested the inventory in Singapore. Four items that were not applicable in the Singapore context were removed and two others were modified to suit the Singapore culture. The reduced 96-item inventory was used in the present study and the Cronbach alpha reliability coefficient obtained was .91. Sample items in the inventory:

12. I am unconventional in many ways.
42. I would rate myself high in self-confidence.

The 96-item inventory was administered by one of the researchers in late May 2000. Explanation was provided for the items when it was deemed necessary. In this way, consistency in the administration of the inventory was assured. The students took approximately 50 minutes to complete the inventory.
b. Teacher rating of student's creativeness

All teachers who taught the sampled classes were asked to rate each student involved on a 5-point scale on creativity. The Olympic gymnastic scoring procedure was employed to ensure that the rating is reliable. To facilitate the scoring process, the teachers were provided with a scoring rubric and photographs of the students. Each subject teacher gave a score and the sum of the scores for each student reflected the teachers' perception of the creative ability of that particular student. The process was repeated for all the students in the sampled classes.

c. Creative figural flexibility

Another measure of the creative ability used was the Circles test of creativity by Torrance (1966). This test was selected because it is a non-verbal test and thus can bring out the creative ability of students even of those with weak verbal skill. This test was administered to the sampled classes two weeks after the HDYT inventory. After the researcher gave the instructions, the students were provided with one-inch circles and were required to draw as many different pictures as possible in five minutes using the circle as a base. The performance is usually scored for fluency, flexibility, originality and elaboration. However in this study, only the flexibility in output was used as a measure of creativity. The flexibility score is the number of categories of output that the student generates in drawing the pictures. For consistency, one researcher scored all the scripts. Six weeks later, the scripts were remarked and the intra-marker scoring reliability was determined. The intra-rater scoring reliability of the circles test obtained after a six-week period was .949.

d. Subject achievement score

The achievement score for each of the subjects (English, Mathematics, Science and Geography) was derived using the school record of continuous assessment scores, including the Mid-Year Examinations. The average performance score was used as the achievement score for the subject.

e. General academic achievement

The general academic achievement measure was derived from the average of the sum of achievement scores for all the four subjects (English, mathematics, science and geography).

Analysis

The data collected was analyzed using the SPSS: PC Windows Programme. Descriptive statistics are used to describe the responses of the sample. Correlation
analysis and t-test analyses were used to answer the research questions. Where comparison of means scores was made, the level of significance was set at the 5 percent level.

Results

Relationship between creative measures

Relationships between creative personality trait (HDYT), teachers’ rating of student’s creativeness (TRSC) and creative figural flexibility (CFFY) were examined using the Pearson-product correlation analysis to answer research question 1. Table 2 shows the result of the correlation analysis.

<table>
<thead>
<tr>
<th>Creative measures</th>
<th>HDYT</th>
<th>TRSC</th>
<th>CFFY</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDYT</td>
<td>-</td>
<td>.200**</td>
<td>.230**</td>
</tr>
<tr>
<td>TRSC</td>
<td>.200**</td>
<td>-</td>
<td>.230**</td>
</tr>
<tr>
<td>CFFY</td>
<td>.230**</td>
<td>.239**</td>
<td>-</td>
</tr>
</tbody>
</table>

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

All three measures of creativity are positively correlated to each other and the correlation coefficients are statistically significant. Though the three measures have some commonality, this is not very marked. The validity coefficients are not as high as expected and are much lower than the value \( r = .42 \) obtained by Davis (1975). The creative personality (HDYT) score of pupils has only a 5% overlap with teachers’ rating of the creativity ability of their students and the creative figural flexibility score. This suggests that the three measures are assessing different aspects of creativity.

Impact of Thinking Programme on creativity

To examine whether the thinking programme had an impact on the creativeness of students who participated in this study, the mean scores of students who were exposed to the thinking programme and those who were not exposed to it were compared using the t-test analysis. The results are shown in Table 3.

The creative personality trait, as measured by HDYT, does not appear to be influenced by the thinking programme, whereas the teachers perceive the Secondary Two students who had gone through the thinking programme as more creative than the Secondary Three students who were not exposed to it. The Secondary Two students also performed significantly better in the Circles test than the Secondary Three students. If the creative personality trait is considered
Table 3.
Comparison of mean-scores on creative measures of Secondary Two and Three students.

<table>
<thead>
<tr>
<th>Creative measure</th>
<th>Level</th>
<th>Mean (Std.Dev)</th>
<th>t-value</th>
<th>Probability (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFFY</td>
<td>Sec Two (N = 72)</td>
<td>11.76 (3.39)</td>
<td>4.45</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>Sec Three (N =101)</td>
<td>9.43 (3.44)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HDYT</td>
<td>Sec Two (N = 73)</td>
<td>295.23 (36.59)</td>
<td>0.67</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>Sec Three (N =107)</td>
<td>291.47 (37.48)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRSC</td>
<td>Sec Two (N = 73)</td>
<td>2.67 (0.97)</td>
<td>5.27</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>Sec Three (N =107)</td>
<td>1.98 (0.68)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

as an innate quality and the thinking programme as a means to develop it, then the better performance of the Secondary Two students in the Circles test may be taken as an indication of the influence of the thinking programme on students' creativeness since it is a measure of divergent and flexible thinking which is a characteristic of creative thinking.

Relationship between creative measures and achievement in school subjects

Relationships between the three measures of creativity and the achievement scores in four school subjects, namely English, Mathematics, Science, Geography and the overall achievement score were examined using the Pearson correlation analysis to answer research question 2. The results of the analysis are shown in Table 4.

Table 4.
Relationship between creative measures and achievement in school subjects.

<table>
<thead>
<tr>
<th>Creative measures</th>
<th>English</th>
<th>Mathematics</th>
<th>Science</th>
<th>Geography</th>
<th>Overall Achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDYT</td>
<td>.255**</td>
<td>.049</td>
<td>.167*</td>
<td>.218**</td>
<td>.200**</td>
</tr>
<tr>
<td>TRPC</td>
<td>.500**</td>
<td>.577**</td>
<td>.707**</td>
<td>.690**</td>
<td>.788**</td>
</tr>
<tr>
<td>CFFY</td>
<td>.287**</td>
<td>.066</td>
<td>.202**</td>
<td>.239**</td>
<td>.233**</td>
</tr>
</tbody>
</table>

*Correlation is significant at the 0.05 level (2-tailed)
**Correlation is significant at the 0.01 level (2-tailed)

An interesting feature in the results tabulated in Table 4 is the relatively high correlation between teachers' rating scores and the students' achievement scores in the school subjects. This may be due to teachers being influenced by the academic ability of their students when judging their students' creativeness and also because they did not have a clear concept about creativity. This could have resulted in some confusion between the concept of creativity and academic ability.

Achievement in English, Science, Geography and the overall achievement are positively related to all three measures of creativity. Achievement in Mathematics
is related only to teachers' rating measure. The relationship is statistically significant in all these cases. This indicates that creativity traits have some influence on achievement in school subjects. The creative personality trait seems to have more influence on achievement in arts subjects than on subjects with a fixed set of knowledge base and skills like Mathematics and Science. Perhaps the manner of assessment in these school subjects does not allow students to reveal their creativity.

Impact of thinking programme on academic achievement

To determine the impact of the school's thinking programme on the academic achievement as a whole and on individual subjects, the mean scores of students who were exposed to the thinking programme and those who had not participated in it were compared using the independent sample t-test analysis. Table 5 shows the results of the t-test analysis.

<table>
<thead>
<tr>
<th>Achievement</th>
<th>Level</th>
<th>Mean (Std.Dev)</th>
<th>t-value</th>
<th>Probability (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>Sec Two (N = 72)</td>
<td>243.60 (45.72)</td>
<td>5.46</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>Sec Three (N =102)</td>
<td>206.56 (43.06)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>English</td>
<td>Sec Two (N = 73)</td>
<td>57.16 (8.72)</td>
<td>11.02</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>Sec Three (N = 107)</td>
<td>43.00 (8.07)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mathematics</td>
<td>Sec Two (N = 73)</td>
<td>59.25 (17.00)</td>
<td>2.28</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>Sec Three (N = 107)</td>
<td>52.88 (20.29)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science</td>
<td>Sec Two (N = 72)</td>
<td>61.70 (17.29)</td>
<td>2.27</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>Sec Three (N =102)</td>
<td>55.40 (11.40)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geography</td>
<td>Sec Two (N = 72)</td>
<td>65.48 (13.39)</td>
<td>4.65</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>Sec Three (N =102)</td>
<td>55.29 (15.89)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The results seem to indicate that the thinking programme has had an impact on the overall achievement of students who were exposed to it as well as on their performance in the four subjects examined. However, it must be kept in mind that the achievement scores of the two groups of students are based on different sets of tasks carried out at their respective levels. Nevertheless, the Secondary Two students have performed better vis-à-vis their task though they are in terms of general ability comparable to the Secondary Three students. The greatest impact seems to be in English, as this subject allows for creative thinking in creative writing tasks. The difference in the mean scores between the groups is 14.16 points.

Conclusion

Creativity has received increasing emphasis in the past decades in education, as it is now recognised that every individual has the potential to be creative in one or multiple domains. The progress and wellbeing of any society depend on the
cultivation of the creative talents of the individuals in the society. The schools have now been asked to play a greater role in the development of the creative potential of their students. In the Singapore context, a specially designed thinking programme has been introduced to cultivate the critical and creative thinking habits of students.

The three measures used to measure creativity in this study are positively correlated but the correlations are low. This may indicate that the three measures are assessing three different aspects of creative behaviour as we all know that creativity is a multi-dimensional concept. Teachers’ perception of the creative potential of their students seems to be very much influenced by the academic ability of their students. Teachers seem to recognise and prefer high IQ individuals rather than high creative individuals as they are less known to them. This is clearly indicated by the high correlation between teachers’ ratings and the academic achievement scores of students. This seems to suggest that the use of teacher’s rating in assessing students’ creativity may not be reliable. The low correlation between the measures indicates that they measure different aspects of creativity.

The thinking programme currently implemented in schools has a significant influence on creative thinking as measured by the creative figural flexibility of the sample in this study. The thinking programme, however, does not appear to bring about a significant change in the HDYT measure. This is not surprising, as the HDYT seems to measure the creative potential of an individual in terms of his personality and biographic characteristics, which are innate qualities of the individual and hence not easily altered.

The examination of the relationship between creativity and achievement in school subjects showed that creativity has a positive but small contribution to achievement in school subjects, especially in arts subjects like Language and Geography, where there is more scope for individual expression compared to Science and Mathematics. The low contribution of creativity to academic achievement in schools is understandable as school assessment is very structured, giving little leeway for creative expression. The result as a whole seems to indicate that creativity provides some value-added benefit to students’ academic achievement.

The study also indicates that the thinking programme has a positive impact on overall academic achievement as well as on performance in the individual school subjects. This is in line with Torrance’s (1995:24) view that creative thinking contributes to acquisition of knowledge and could be as important as memory and other intellectual functions. The greatest impact appears to be on the performance in English Language.

We are of the opinion that the continued implementation of the thinking programme would benefit the pupils and bring about better academic achievement and creative thinking. This, together with the changing modes of assessment that are being slowly introduced into the school system, will help students become more creative in thinking. Consequently, every teacher should consider the development of creative talent as important or more important than teaching information. They should attempt to infuse creative thinking in the teaching and
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learning of subject content and skills they teach as creative thinking helps in the acquisition and synthesis of information. Perhaps, teachers could adopt the creative fostering behaviours outlined by Soh (2000) as well as incorporate activities considered useful for fostering creativity by Singapore teachers in their teaching (Tan, 2001).

For creative thinking to take root in a society Torrance (1995:44) suggests that society should "value creative thinking because children are going to achieve those things that are valued by the society in which they live". Plato held the view that "what is honoured in a country will be cultivated there". Therefore it is important to cultivate the right environment as some environments can nurture creativity and others can squelch it. The legitimacy to think divergently, and freedom from the threat of evaluation can also facilitate creative production. Our current emphasis on achievement scores that rewards only memory and analytical skills need to be further examined. As Sternberg and Lubart (1995:29) warned, "Our reliance on test may be squandering what is arguably our most precious human resource — creativity". Hopefully, the new assessment modes being introduced in Singapore schools will overcome this problem.

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References


