

**DOES PRESENT EDUCATION FAVOUR EXECUTIVE AND EXTERNAL  
STYLES OF THINKING AT THE EXPENSE OF ACHIEVEMENT IN SCIENCE?**

**Dr. K. Abdul Gafoor**

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## **DOES PRESENT EDUCATION FAVOUR EXECUTIVE AND EXTERNAL STYLES OF THINKING AT THE EXPENSE OF ACHIEVEMENT IN SCIENCE?**

Science is a body of knowledge, way of investigation and way of thinking. The process aspect of science concentrates mainly on the way of thinking. The awareness of style of thinking is useful in perceiving the students as he/she is. 'Teachers need to teach students, how to think, instead of teaching what to think' (Clement and Lochhead, 1979). The way of thinking inculcated through the process of education decides how the individual learns further. Teachers, their way of thinking, their teaching styles can decide how the pupil think. Dual function of teachers here is to shape the thinking according to the requirements of the discipline and facilitate students understanding of the subject by presenting the subject in tune with the students' way of thinking.

Theoretically, this study bases on Sternberg's theory of mental self-government (1997). Sternberg contended that as there are many ways of governing a society, there are many ways of governing and managing our activities. These different ways of managing our activities are our thinking styles. Sternberg defines thinking styles as our preferred ways of governing or managing our activities. The theory of mental self-government view people as self-organizing systems that actively shape their environment as well as themselves. People not only shape their environment, but also are being shaped by the environment. They influence and respond in varied ways to the environment, depending on large part upon their styles of responding.

Sternberg proposes thirteen thinking styles grouped within Five Dimensions of Mental Self Government viz; Function, Form, Level, Scope, and Leanings. In this study only two dimensions namely *functions and scope*, of thinking, are considered. *Function* refers to how mind copes with the world. study stud As if a government the mind legislates, plans, implements, executes, judges, and evaluates. Sternberg identifies three distinctive thinking styles in the functioning of mind as *legislative, executive and judicial*. Sternberg classified the scope into internal and external on the assumption that governments need to deal with internal or domestic affairs and with external or foreign ones. Similarly, mental self-governments need to deal with both internal and external users, as people find out every day in their personal lives and at work.

### **Purpose of the present study**

Present study attempts to find out the preferred functions of thinking and scope of thinking among secondary school students and its impact on achievement in physics at Secondary School Leaving Examination (SSLC) examination.

The specific objectives of this study are: (1) to find out the preferred functions of thinking, (2) to find out the preferred scope of thinking, (3) to find out gender difference, if any, in the function and scope of thinking among secondary school students. Finally, (4) it intends to find out difference, if any, in achievement in physics in Secondary School Leaving Examination (SSLC) examination in high and low groups of thinking styles based on functions and scope of thinking.

### **Group difference in functions and scope of thinking**

Review shows that gender based style differences are more in functions of thinking. Females showed significant stronger preference for executive thinking style than male students did (Cilliers and Sternberg 2001). Verma (2001) also noted that female college students had more inclination towards the use of legislative and executive thinking style. Gender had significant influence on executive and external thinking styles (Verma and Monika 2006). Secondary school students from high socio-economic status families obtained significantly higher score on legislative thinking style than students from lower socio economic status families (Sternberg and Grigorinko 1995). Rural urban differences in thinking styles are most negligible (Verma 2001). Indian senior secondary students had significantly stronger preference for legislative and lower preference for external thinking (Verma 2004).

### **Thinking styles and academic achievement**

Most of the studies on thinking styles showed significant relationship with academic achievement (Grigorenko and Stenberg, 2001, Zhiching, 1994, Cano Garcia, 2004). However, there are studies that found out no relationship between thinking style and academic achievement as well (Dominich, 2001; Gakhar, 2006). Styles show significant correlation with academic achievement of secondary school students evaluated by marks in final examination and independent project (Grigorenko and Sternberg 1997). The executive style significantly positively predicted students' achievement in advanced level tests. Zhang (1998) found that legislative and executive styles correspond to high achievement. Cano Gacia's study (2004) found internal,

legislative and executive styles contribute to achievement. Bernado and Celcieng (2002) showed that percepts of Sternberg's theory apply to non-western culture as well and thinking style is related to academic achievement.

In case of functions of thinking style, most of the studies relating achievement and thinking styles support its contribution to achievement, especially of executive and legislative styles. Regarding the scope of thinking style dimension the only study supporting its contribution to achievement is by Cano Garcia (2000) that internal style contributes to high achievement. Studies of Zhang (2004), Cilliers and Sternberg (2001) reminds that thinking styles are subject specific. The use of judicial style uniquely contributed to better achievement in natural sciences (Zhang 2004). Park et al (2005) found legislative, Judicial, external and style contribute to scientific giftedness.

### **Sample for the Study**

Study used a representative sample of 617 students drew by stratified random technique from government and government aided higher secondary schools of two revenue districts. The data was collected within a period of four months after they were admitted into standard IX. The total sample includes 344 girls and 273 boys.

### **Measures in the study**

#### *(a) Thinking Styles inventory*

Measures on the thinking styles based on functions and scope of thinking were obtained using Thinking Style Inventory (Gafoor and Lavanya, 2007). The language employed is mother tongue of respondents. Indices of adequate Test retest reliability and criterion related validity [obtained with "Sternberg-Wagner Thinking Style inventory" developed by Sternberg and Wagner (1991)] were ensures for the measures.

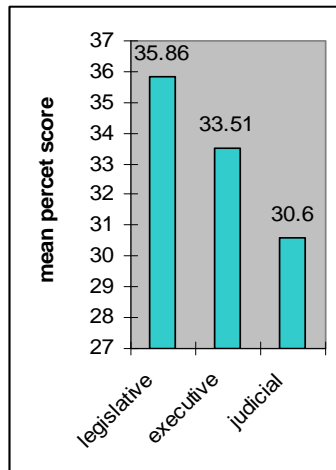
#### *(b) Achievement in physics*

Index of achievement in physics considered in the study is the numeric grade obtained by the student in physics for the Secondary School Leaving Certificate (SSLC) examination. This grade point is derived as an aggregate of scores of a written test in physics conducted by the Board of Examinations (Kerala state), and continuous evaluation of the student in the school based seminars, projects and other assignments done in physics . This numerical grade is considered an index of more stable achievement in physics.

## Analysis and results

### 1) Preferred functions of thinking among students

Figure 1 shows the extent of each function of thinking among secondary school students.



*Figure 1: Extent of legislative, executive and judicial thinking styles among secondary school students.*

Results of the paired comparison of the mean scores of the three function of thinking showed that legislative thinking style is preferred by secondary school students (mean= 35.86, S.D=1.56) over both executive (mean= 33.51, S.D=1.70,  $t = 1.98$ ,  $p < 0.05$ ) and judicial (mean= 30.6, S.D=1.43,  $t = 5.31$ ,  $p < 0.01$ ) styles. The least preferred function of thinking is judicial, which is preferred less than executive thinking style ( $t = 2.26$ ,  $p < 0.01$ ).

### 2) Preferred scope of thinking styles among secondary school students

Results of the paired comparison of the two scopes of thinking among secondary school students showed that external thinking (mean= 26.04, S.D=6.03) is very strongly preferred over internal thinking (mean= 13.96, S.D=6.03) style ( $t = 24.87$ ,  $p < 0.01$ ). Figure 2 shows the extent of preference for external style of thinking over internal style of thinking.

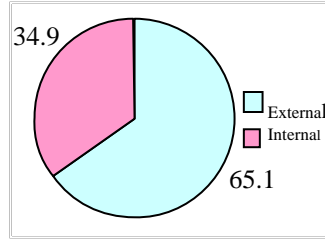


Figure2: Comparison of extent of internal and external thinking styles in terms of mean percent score

### 3. Thinking styles among boys and girls

Higher secondary school girls and boys were compared with respect to their thinking styles in function and scope dimensions. For legislative thinking style boys have higher preference (mean= 3.75, S.D= 1.53) than girls (mean= 3.46, S.D= 1.58) ( $t= 2.30$ ,  $p<0.05$ ). Though girls have more executive (mean= 3.47, S.D= 1.70) than boys (mean= 3.20, S.D= 1.72) the difference is not statistically significant ( $t= 1.93$ ,  $p>0.05$ ). There exist no gender difference in judicial ( $t= 0.41$ ,  $p>0.05$ ), external ( $t=1.07$ ,  $p>0.05$ ) or internal ( $t=1.07$ ,  $p>0.05$ ) styles of thinking.

### 4) Achievement in physics in Secondary School Leaving Examination (SSLC) examination in high and low groups of thinking styles

Mean scores of achievement in physics of high and low groups in each of the five thinking styles were compared using test of significance of difference between independent samples. Results are in table 1.

Table 1: comparison of mean score of achievement in physics of high and low groups based on thirteen thinking styles

Thinking styles	SSLC Grade point score (mean)		Critical ratio
	Low	High	
legislative thinking	5.77	6.02	2.44*
executive thinking	5.94	5.71	2.50*
judicial thinking	5.75	5.98	2.39*
external thinking	5.90	5.77	1.38
internal thinking	5.78	5.92	1.55

Note: \* denote significance at 0.05 level

In the achievement in physics, there exist significant difference between high and low groups of legislative ( $t= 2.44$ ,  $p<0.05$ ), executive ( $t= 2.50$ ,  $p<0.05$ ), judicial ( $t= 2.39$ ,  $p<0.05$ ), thinking styles. Grade point in physics increase as the level of legislative, judicial styles increases. It decreases as the level of executive styles increases. Though students with high internal style of thinking has higher grade in physics, and those with higher external style of thinking has lower grade in physics, these differences are not statistically significant.

Figures 3A, shows that as legislative thinking increases grade point in physics increases markedly among girls. It is very desirable that this most preferred thinking style among functions of thinking is favorable for higher achievement in science. Figure 3C shows that executive thinking styles which is second in preference to legislative style among students is associated with low achievement. Figure 3C shows that judicial style enhances achievement in science secondary school students, especially so among boys. So boys have the double advantage that they have more of thinking style that favor achievement in physics, and less of the thinking style which demotes achievement. Teachers need to de-emphasize on students' following rules and guidelines, avoid giving structured or fabricated problems, and avoid giving and insisting on directions and orders of how to study, and prescribing rigid rules of evaluation. Instead they need to encourage comparing, analyzing things and making evaluations about quality, worth, effectiveness of existing things and ideas. This will be helpful to adopt more favorable ways of thinking, and thus improve achievement.

Figure 4A shows that external style of thinking reduces the achievement in physics markedly among boys. Worse, it is the preferred way of thinking among students. Boys have a further disadvantage that this style is more among them than in girls. Predictably, Figure 4B shows that internal thinking favors achievement, especially among boys. However, that style of thinking is less among students in general, more so among boys. In this regard, teachers need to be aware that the present curricular practices are highly favorable for developing external thinking style through work on tasks that allow for collaborative ventures with other people, encouraging outgoing and people oriented learning tasks. Science achievement requires the pupil to learn to focus on tasks that

allow one to work as an independent unit, sometime turning inward, introverted, task oriented than people oriented.

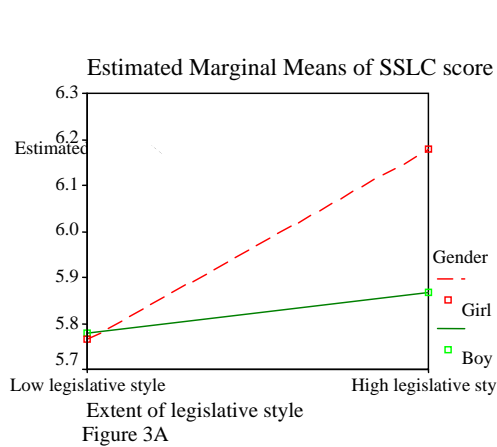


Figure 3A: achievement means score in high and low legislative thinking groups among girls and boys of secondary school students

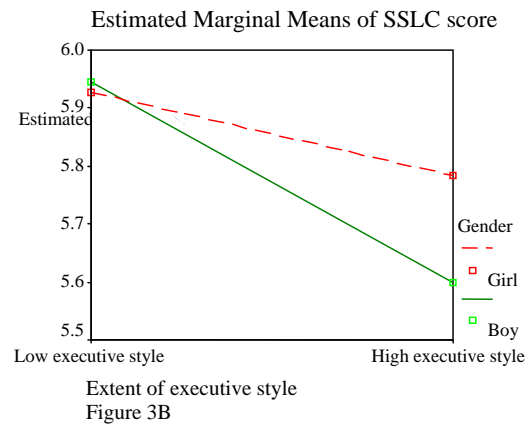


Figure 3B: achievement means score in high and low executive thinking groups among girls and boys of secondary school students

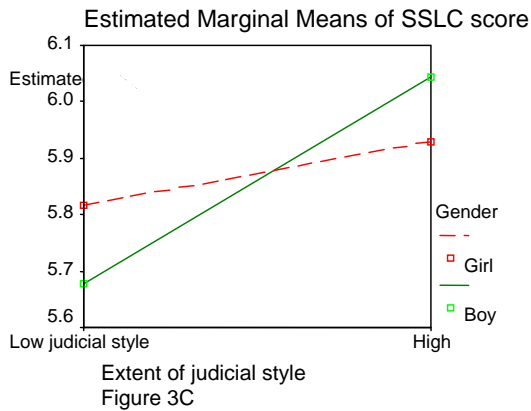


Figure 3C: achievement means score in high and low judicial thinking groups among girls and boys of secondary school students



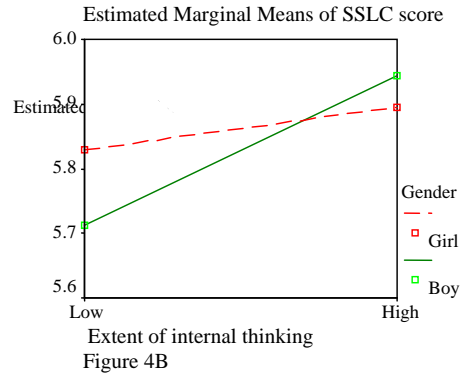
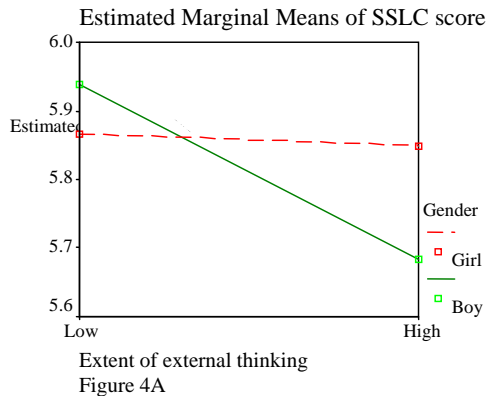


Figure 4A and B: achievement means score in high and low (A) external and

(B) internal thinking groups among girls and boys of secondary school students

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