COGNITIVE REHABILITATION AND PROBLEM-SOLVING AMONG SECONDARY SCHOOL STUDENTS OF KERALA

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ABSTRACT

The study examines problem solving and Cognitive Rehabilitation among secondary students of Kerala. Problem Solving Test and Cognitive Rehabilitation test for conducting normative survey in the present study. Logical memory and working memory were the two Cognitive Rehabilitation components used in the study. The study revealed significant relationship between Problem Solving and Cognitive Rehabilitation among secondary school students. Secondary school students with low problem solving showed significantly low Cognitive Rehabilitation. The findings of the study imply the need for adopting problem solving strategies to facilitate the accelerating Cognitive Rehabilitation among secondary school students.

Key terms: Problem solving, Cognitive Rehabilitation, Working memory, Logical Memory

I. INTRODUCTION

To discuss the consequences of early competence in problem solving for the later cognitive and social achievements of a child. A distinction must be made between overall cognitive competence and particular cognitive Rehabilitation. The aim stated above implies that there is such a thing as the former that general cognitive competence exists. I know much more about the latter, about how a child comes to master particular problems. I will therefore begin by outlining a theory of this process (A Model of Problem Solving in Early Childhood). This will provide a basis for discussing general competence in problem solving from the point of view of a child’s early experience.

Problem solving is regarded as one of the primary skills that the student must take with them when they leave the classroom and enter the real world. Problem solving depends on a person’s previous experience and requires the capacity to reason, calculate, recognize patterns and handle logical thinking. Problem solving discourages rote learning and Problem solving is an outcome of learning science. If science is taught through problem solving, pupils may develop, working memory and logical memory, which will lead to greater achievement in life.

WORKING MEMORY

Working memory is the capacity of a person to hold and process information in the mind for a short period of time and is useful for the further processing. Working memory is the active memory. It is not the short term memory. In working memory people manipulate and convert the verbal and visual information. Working memory supports the day to day activities of a person in a very meaningful manner.

LOGICAL MEMORY

Logical memory depends upon intelligent understanding or assimilation. It does not depend upon mere repetition. A boy thoroughly understands a theorem of geometry and reads it a number of times. He can easily retain and reproduce it on proper occasions. This is logical memory.

II. PROBLEM SOLVING IN EARLY CHILDHOOD

I believe that a theory of the acquisition of motor skills provides the basic outline of a theory of the acquisition of particular cognitive achievements. Such a theory of skill acquisition has been sketched by a number of authors (Bernstein, 1967; Connolly, 1973; Elliott and Connolly, 1974; Welford, 1968). The particular formulation that
has influenced me most is Jerome Bruner’s (Bruner, 1969), but all these theories have many common features. They all agree that skills are goal-directed and therefore any model must include means/end analyses. Skills are analysable into constituents and one of the problems in the performance of a skills involves learning new constituents, perfecting them through practice (Bruner’s ‘modularization), and the learning of new combinations. An essential component is a prerequisite for their combination in sequences of skilled activity. This implies that sometimes we should find preadaptive constituents; that is, elements of skills which have not yet been incorporated into successful sequentially organised acts. This is indeed the case (Bruner and Koslowski, 1972).

While it is clear that there is an intimate link between emotional and intellectual development, love emotional security and feelings of control on their own are not sufficient. Young children also need intellectual challenge. When we examine research about the processes of children’s learning, as a consequence of the work of psychologists such as Piaget and Vygotsky, it is now widely accepted that children learn by a process of actively constructing their own understandings. An important characteristic of the human brain is that we all find enjoyment in mental activity; on the downside, this also means that we experience boredom quickly and easily, and this is most true when we are young children and our brains are at their most active. All the evidence suggests that a learning environment which challenges young children intellectually and stimulates them to be mentally active is one that they will enjoy, that will engage their attention and provoke learning. It also turns out to be crucial, once again, that the children are put in control. Such an environment will provide new experiences, embedded in meaningful contexts, opportunities for active styles of learning, involving children in problem solving, investigations and opportunities for self-expression, and, perhaps most crucially of all, opportunities for learning through play.

III. REVIEW OF STUDIES ON POPULAR MODELS OF PROBLEM SOLVING

For facilitating effective problem solving among students, teachers should know the strengths and weaknesses of various problem solving strategies, realize what, why and how they are solving a problem, in order to understand the strategies completely and select the most appropriate ones. Normah and Salleh (2006) observed that students who can successfully solve problems possess good reading skills, have the ability to compare and contrast various cases, can identify important aspects of a problem, can estimate and create analogies and attempt trying various strategies. Therefore, educators must adopt appropriate problem solving methods and offer opportunities for students to explore and prepare learning activities by encouraging them to think critically and creatively (Snyder, 1998).

Newell, Shaw and Simon (1959) formulated a general problem solving model with seven steps viz., define problem, gather facts, consider possibilities based on facts, creation of action plans, implement action plan, observe results and repeat process.

Woodset.al (1975) proposed a problem-solving model which includes five steps viz., define the problem, think about it, plan a solution, carry out the plan and look back. ‘Defining the problem’ helps in identifying the system under study by interpreting the information provided in the problem statement as well as identifying the unknown and select criteria for success. ‘Thinking about it’ includes letting it simmer, identifying specific pieces of knowledge and collecting information. ‘Planning a solution’ enables the problem solver to consider all possible strategies and choose the best strategy. ‘Carrying out the plan’ involves executing the solution. ‘Looking back’ encourage the problem solver to reflect.

Mayer’s (1992) model for problem solving consists of four phases viz., problem translation, problem integration, solution planning and monitoring as well as solution execution. During the first phase of problem translation, the problem-solver transforms the statements of the problem into a mental model that represents the problem-solver’s interpretation of the problem. In the second phase, problem integration, the different pieces of this interpretation are combined into a coherent structure that will support a problem-solving plan. In the third phase, solution planning and monitoring, the problem-solver formulates a plan in the form of a sequence of steps for solving the problem. Finally, during the solution execution phase, the problem-solver carries out this plan, and solves the problem.

Heller and Heller (1995) proposed the ‘Logical Problem-Solving Model’ which involves five steps to solve problems in Physics: ‘Focus the problem’ develops a qualitative description of the problem. ‘Describe the Physics’ helps to prepare a quantitative solution using one’s qualitative understanding of the problem. ‘Plan the solution ’ helps to translate the description of physics into a set of equations. ‘Execute the plan’ helps the student to execute the planned solution and finally in ‘Evaluate the answer’ the work is checked to see that it is properly stated, reasonable, and has answered the question asked.
Gresham (2002) proposed a problem solving model which includes evaluating a student’s response-to-intervention (RTI) as an alternative to the IQ-achievement discrepancy approach to identifying learning disabilities. RTI includes problem solving procedures viz., implementing evidence-based interventions, frequently measuring a student’s progress to determine whether the intervention is effective, evaluating the quality of the instructional strategy and evaluating the fidelity of its implementation.

IV. HYPOTHESES

The research hypotheses formulated to study problem solving and Cognitive Rehabilitation among secondary students are:

Hypothesis 1: There is a significant relationship between problem solving and Cognitive Rehabilitation among secondary students.

Hypothesis 2: There is significant difference between secondary students with low problem solving and high problem solving in the Cognitive Rehabilitation test viz., working memory and logical memory.

V. OBJECTIVES OF THE STUDY

1. To examine the relationship between problem solving and Cognitive Rehabilitation among secondary students.

2. To compare the secondary students with high problem solving and low problem solving with respect to Cognitive Rehabilitation test viz., working memory and logical memory.

METHODOLOGY

The study on problem solving and Cognitive Rehabilitation secondary students was designed as a descriptive study. Normative survey was the method adopted for the study. The study consisted of a representative sample of 150 students selected at random, from the secondary schools of Kerala. Cognitive Rehabilitation Test and Problem Solving Test developed by the investigator for secondary students were the tools used for the study. Data was analyzed by computing percentages, critical ratio and coefficient of correlation.

ANALYSIS AND INTERPRETATION

The classification of sample (N=150) into high and low subgroups according to their levels of problem solving and Cognitive Rehabilitation is presented in Table 1.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Secondary students</th>
<th>CR</th>
<th>df</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
<td>High</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Problem solving</td>
<td>N1</td>
<td>P1</td>
<td>N2</td>
<td>P2</td>
</tr>
<tr>
<td>Cognitive Rehabilitation</td>
<td>43</td>
<td>28.67</td>
<td>22</td>
<td>14.67</td>
</tr>
</tbody>
</table>

Critical ratio tests showed significant difference in the proportion of secondary students having low problem solving and high problem solving (CR = 2.47; df = 64; P < .01). The proportion of secondary students with low problem solving (28.67 percent) is significantly high than the proportion of students with high problem solving (14.67 percent).

The relationship between problem solving (M1=8.19; σ1=5.06) and Cognitive Rehabilitation (M2=9.25; σ2=7.33) among secondary students (N=150) was examined by computing the coefficient of correlation (r = 0.76; df = 149; P < .01), which substantiated Hypothesis 1. The finding therefore revealed that there is significant relationship between Problem Solving and Cognitive Rehabilitation among secondary students.

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The subgroups of secondary students with low problem solving and high problem solving were compared with respect to the working memory and logical memory of Cognitive Rehabilitation by computing the critical ratios from the respective arithmetic means and standard deviations to examine the Hypothesis 2. The critical ratios computed with respect to the Cognitive Rehabilitation are presented vide Table 2. The critical ratios revealed that secondary students with low problem solving differed significantly from secondary students with high problem solving with respect to Cognitive Rehabilitation test viz., working memory (CR = 8.82; df = 68; P < 0.01) and logical memory (CR = 7.75; df = 76; P < 0.01).

Table 2
Comparison of low and high problem solving groups with respect to Cognitive Rehabilitation

<table>
<thead>
<tr>
<th>Cognitive Rehabilitation test</th>
<th>Problem solving subgroups</th>
<th>CR</th>
<th>df</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
<td>High</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>( N_1 ) M_1 ( \sigma_1 )</td>
<td>( N_2 ) M_2 ( \sigma_2 )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working Memory</td>
<td>45 13.843.69</td>
<td>23 25.575.81</td>
<td>8.82</td>
<td>68</td>
</tr>
<tr>
<td>Logical Memory</td>
<td>50 15.863.56</td>
<td>26 25.465.77</td>
<td>7.75</td>
<td>76</td>
</tr>
</tbody>
</table>

The findings substantiated Hypothesis 2, thereby establishing that there is significant difference between secondary students with low problem solving and high problem solving in the Cognitive Rehabilitation test viz., Working Memory and Logical Memory. From Table 2, it is evident that secondary students with low problem solving possessed significantly low Cognitive Rehabilitation viz., working memory (\( M_1=13.84; M_2=25.57 \)); and logical memory (\( M_1=15.86; M_2=25.46 \)) than secondary students with high problem solving.

**MAJOR FINDINGS**
1. There is a significant relationship between problem solving and Cognitive Rehabilitation among secondary students.
2. There is significant difference between secondary students with low problem solving and high problem solving in the Cognitive Rehabilitation test viz., Working Memory and Logical Memory

**IMPLICATIONS**
The findings of the study imply the need for adopting problem solving strategies to facilitate the accelerating of Cognitive Rehabilitation among secondary students. The logical thinking patterns developed through process approach can be readily transferred to new learning situations and life through best practices in science education. Since working memory and logical memory tend to last longer than the learned content and influence our problem solving in day to day life, directly or indirectly, constructivist approach for teaching science may be adopted to accelerating Cognitive Rehabilitation through problem solving.

**REFERENCES**