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FAILURE OF COGNITIVE GROUP TASKS IN SECONDARY SCHOOLS OF PAKISTAN

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In order to undertake a cognitive developmental study of secondary school children of Pakistan, it was decided to try-out cognitive group tasks. However, difficulty in using these tasks led to an exploratory study for assessing relative advantages and disadvantages of using group tasks in place of traditional Piagetian method of individual interviewing. Two comparable groups of 50 secondary school children were administered identical tasks in individual and group situations. Individual situation proved consistently superior in assessing children at their optimum cognitive levels. Though there was a significant positive correlation between results of individual tasks and group tasks, differences between the means of scores of two methods also proved significant on a number of statistical tests. The experience of administering group tasks in classrooms pointed out peculiar cognitive styles of children which hindered their optimum cognitive functioning.

National Institute of Psychology (NIP), since its inception in 1976, has been involved in psychological research in the area of education. From 1978 to 1982 it completed a major project on cognitive development of primary school children in Pakistan. The main component of this investigation was the assessment of cognitive developmental abilities of primary school children in Pakistan (see Pervez, 1982). This project was undertaken in the framework of Piagetian Psychology. Earlier criticism on Piagetian methodology was focused on its three aspects: reliance on verbal inquiry, small size of sample and lack of 'standardized' and 'objective' tools. Piaget himself shifted from 'interview' to 'task' which essentially means that the subject, rather than merely answering verbal questions, will participate and/or reflect upon some activity. The size of sample continued to be small. Nevertheless, during his life time Piaget never accepted it to be a problem in his work. The concept of standardized and objective tests, in the last two decades, has itself faced much criticism and at least Piagetians do not feel apologetic on the account of their tools not being 'standardized' and 'objective.'

Size of sample in any research is basically determined by two considerations, i.e., the nature of problem being investigated and time and financial resources available for that research project.

The research team of NIP discussed the size of sample for quite some time for its cognitive research project on primary schools. If one is following the basic spirit of Piagetian method, then, within a limited time and financial framework, a very large sample is not possible. Piagetian inquiry in one-to-one situation is indeed time consuming.

A number of investigators in this field have been considering possibility of developing standardized tasks while keeping the fundamental spirit of the method intact. Lunzer's (1977) work is one of such examples. Concepts in Secondary Mathematics and Science (CSMS) programme established in 1974 at Chelsea College, Centre for Science Education, University of London, tried to overcome the problem of small sample. It devised group tasks for collecting Piagetian data on a large scale. These tasks are known as Science Reasoning Tasks (SRT) and have been published by National Foundation for Educational Research (NFER, 1979). On one hand these tasks maintain the essential features of Piagetian interview and on the other hand these have demonstrated their validity and reliability as psychometric tools (Shayer & Adey, 1981). NIP took a lead from CSMS and tried some class tasks (as these were called by CSMS) in the primary schools but faced total failure. It was then assumed that perhaps children are too young to perform on the tasks in a group situation.

During 1983, National Institute of Psychology embarked upon a new project entitled as Improving Learning and Teaching of Science and Mathematics in Secondary Schools through Study of Cognitive and Personality Variables. This project was a continuation of the previous project in the sense that it also involved study of cognitive abilities of school children. However, now the children were of higher age group, supposedly having mature mental abilities. The sample again became a major point of discussion. As this study was to be at national level, there was a need to go for a larger data base. Method of individual interviewing was the main constraint to collect larger amount of data. Therefore, it was decided to try, once again, group tasks for study of cognitive development of children in secondary schools of Pakistan.

Selection of Tasks

The primary consideration for selection of tasks was their appropriateness for secondary school children. Granted lot of variation of ages of children in our schools, range of 11 to 16 years of age can be expected in Pakistani secondary schools. Keeping in view the general trend of cognitive development, developmental range of children in secondary schools of Pakistan was expected to be from middle concrete operational to middle formal operational thinking. Therefore, tasks appropriate to these developmental stages were selected. The initial list for try-outs was the following.

1) Mountain
2) Perspective
3) Volume and Heaviness
4) Proportionality
5) Equilibrium in Balance
6) Pendulum
7) Combinations of Chemicals

All of these tasks were part of the battery assembled by CSMS (Shayer & Adey, 1981). However, no attempt was made to strictly follow CSMS procedures. Keeping the basic structure of the task intact, procedures and instructions were translated into Urdu, making modifications wherever needed.

The first step was familiarization of the research team[1] with the tasks. Besides memorizing the basic steps, some role playing proved useful for learning to administer the tasks. One important step was evolving instructions and record sheets in Urdu. After preparing initial drafts, these were tried out on various groups of students in some secondary schools of Islamabad. Right from the beginning, attempts to administer these tasks in the classroom created a lot of confusion. Somehow or the other children were not following the instructions and they were producing unexpected answers. The research team, to start

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[1] The research team, at that time, consisted of Mohammad Israr, Naeem Durrani, Sarah Tauquir, Humala Khalid and the present author. I wish to acknowledge the contribution of the team in completion of this work.

with, suspected their own ability and set of procedures, instructions and record sheets. Repeated attempts were made to improve these. However, these attempts did not result into a plausible performance of children. At this stage the team was not prepared to consider a hypothesis that Pakistani secondary school children were devoid of abilities demanded in these tasks.

The greater difficulty was being encountered in the combinations of chemicals. This task was aimed at the higher end of formal operational thinking. Moreover, it was proving difficult to make indigenous the task of chemical combinations concepts. It was, therefore, decided to omit this task from the battery. However, exclusion of combinations of chemicals did not leave the battery without any items on late formal operational thinking.

After repeated try outs, spread over a period of more than two months, it was felt that further improvement in administration of tasks and layout of record sheets is not possible. Yet the researchers were not satisfied with the performance of children on two accounts:

a) Group administration of the tasks require that children in the group are able to follow the instructions to such an extent that difficulty in following the instructions do not adversely affect their ability to invoke their cognitive abilities. However, it was being felt constantly that children were facing difficulties in following the instructions and were not able to keep pace with the administration of the tasks which involved a continuous step by step interaction with the experimenter.

b) A previous study on cognitive abilities of primary school children in Pakistan (Pervez, 1982) indicated that 87% of primary school children fell within Concrete Operational stage. It was, therefore, expected that secondary school children will be at higher level of cognitive development. However, initial try-outs of the group tasks were not indicative of these expected levels.

At this stage the team started thinking whether the method of cognitive group tasks is appropriate for secondary school children of Pakistan or not. In order to make an objective judgement, it was decided to plan an exploratory study so that classical method of individual interviewing could be compared to cognitive group tasks.

METHOD

Sample

Two groups of children,Group G and Group I, each having 50 children, were formed. These groups were selected from a secondary school of Islamabad. 20 children were randomly selected from classes 6, 7, 8, 9 and 10 each. Out of 20 children from each class, 10 were randomly put in Group G and 10 in Group I.

Administration of Tasks

Group G was administered the set of 6 cognitive group tasks. These tasks were administered to this group in three sub-groups because administration of these tasks to a group larger than 15 - 20 children was unmanageable. Classrooms of schools were used for the administration. Two and sometimes more than two researchers participated in the administration. However, only one researcher acted as the administrator of the task while remaining researchers acted as his/her assistants. After trying to develop as much rapport as possible in a short span of time (5 to 10 minutes), record sheets were handed down to the children. They were explained basic procedure of the administration and how to record their responses on the appropriate columns and sections of their record sheets. The administrator then set-up apparatus on the classroom table. He/she demonstrated and explained an activity with the apparatus and asked children to write their responses in the record sheets in the light of the demonstration. After making any clarifications sought by the children and making sure that all the children have written down their responses, the next part of demonstration was carried out. In this manner only one task was completed in one session. All the six tasks were administered in the similar way.

For Group I all the tasks were administered individually. As is the practice in the individual interviewing, the pace of

administration was adjusted to suit the child's level of functioning and record sheets were filled by the researchers themselves. Identical scoring rules were used to score record sheets of Group G and Group I.

RESULTS

Piagetian tasks are aimed at making decisions about existence of a specific cognitive structure in a particular child. Evidence of existence of a specific structure is used to assign a particular level of cognitive ability in that child. Such cognitive levels are associated with cognitive stages or sub-stages. These stages are hierarchical but there is no ground to assume equal intervals of cognitive abilities between these. Therefore, assigning numerical values to Piagetian data continues to be a controversial venture.

Assessment of cognitive abilities through group tasks and individual interviewing was undertaken to find out if group tasks are as effective as individual interviewing in assessing children at their optimum levels of cognitive functioning. The sample consisted of five secondary school classes. Therefore, keeping in view that the tasks are developmental in nature, it would have not been wise to treat all the children as one group. Each class was treated as a group. As the eventual objective of the project was aimed at making decisions about the cognitive levels of different secondary school classes, it was felt desirable to operate at the level of classes rather than at the level of individual children. In order to compare the performance of individual versus group method each class was assigned a cognitive developmental level on each task. This was done by two/thirds pass criterion, a standard traditionally used to assign an overall cognitive level to children in Piagetian research. It essentially means that, for instance, in Mountain (Group G), because out of ten children of class VI, six or more than six children were at 2A level in this task, class VI was given an overall 2A level in Mountain. In the similar manner all the five classes were assigned cognitive levels on all the six tasks in both group and individual tasks.

Besides making decisions about each task, an overall level for each class was also derived. This was done by demanding at least two/thirds of the highest possible levels. For instance, in class VI of Group G the following levels were obtained: 1=1; 1A=1;

2A=3; 2B-=1. 2A was obtained four times (Presence of lower stage is assumed in a higher stage, i.e., one 2A was also counted from 2B-). Therefore, overall cognitive level of class VI of Group G was assessed to be 2A in the total battery.

Results of group versus individual tasks of 35 comparison points (6 tasks and one overall assessment of cognitive levels in 5 classes) are shown in Table 1. Out of these 35 comparison points, results of group versus individual tasks are identical at 7 points. While in the rest of 28 comparison points results of individual tasks are consistently better than the group tasks.

Table 1

Comparison of levels of cognitive development in secondary school classes in group tasks (Group G) versus individual interviewing (Group I).

Tasks	Group	Cognitive Levels of Classes				
		6	7	8	9	10
Mountain	G	2A	2B	2B-	2B	2B-
	I	2B	2B	2B	2B/3A	2B
Perspective	G	1	1	1B	2B	1B
	I	1A	1B	2B	3A	2B
Volume & Heaviness	G	2A	2A	2A	2A/2B-	2A/2B-
	I	2B	2A/2B-	2A/2B-	2A/2B-	2A/2B-
Proportionality	G	2B-	2B-	2B-	2B	2B
	I	2B-	2B-	2B/3A	2B	2B/3A
Equilibrium in Balance	G	2A	2B	2B-	2B	2B-
	I	2B	2B	2B	2B/3A	2B
Pendulum	G	1A	2B-	2B-	2B	2B/3A
	I	2B	2B	2B/3A	2B/3A	3A
Overall Level	G	2A	2A/2B-	2B-	2B	2B-
	I	2B-	2B/3A	2B	2B/3A	2B/3A

Piagetian method is geared up towards assessing cognitive level of subjects at their optimum level of functioning. An intuitive analysis of the above results indicates that in two comparable groups of children, individual interviewing was able to assess children at higher developmental levels than group administration.

For the sake of brevity one can be tempted to leave this analysis at this point. However, at the same time one is also attracted towards further analysis. One obvious recourse is assigning numerical values to the categories of cognitive levels. By following this route one can venture into some statistical inferences. Therefore, the following values were assigned to cognitive levels: 1=1; 1A=2; 1B=3; 2A=4; 2A/2B-=5; 2B-=6; 2B=7; 2B/3A=8; 3A=9.

Sufficient evidence already exists to indicate reliability of group tasks as instruments of measurement of what is measured by Piagetian (individual interviewing based) tasks (Shayer & Adey, 1981). However, the interest here was finding out the amount of differences between the assessment derived through group tasks and individual tasks.

In order to find out the means of scores obtained through group tasks and individual tasks, SPSS 11 Procedure Condescriptive (Morrison, 1982) was run on the data. Mean score of group tasks was 5.3 while mean score of individual tasks was 6.8. An apparent look at these means indicates superiority of individual tasks. In order to assess the significance of this difference of means, it was decided to run SPSS 11 sub-programme T-Test (Morrison, 1982). It showed t value to be 6.93 which, with 34 degrees of freedom, is significant beyond the computing power of SPSS, i.e., 0.000. Another SPSS procedure, Non-Parametric Tests, was also used to verify the conclusions emerging from the above measures. Friedman Test tests the null hypothesis that the k samples have been drawn from the same population (Morrison, 1982). It provides Friedman Chi-square, degrees of freedom and the significance level. Its Chi-square value of 22.4 with 1 degree of freedom was significant beyond computing power of SPSS.

DISCUSSION

Decision about Group versus Individual Tasks

The basic objective of the methodology is to assess the optimum level of cognitive functioning. The first level of analysis of results indicated that individual interviewing tends to do that consistently better. However, in order to further explore the data, numerical values were assigned to cognitive levels. From a theoretical point of view this may not be a correct strategy but this was the only recourse available to get some more meaning from the data. Fairly high correlation between group tasks and individual interviewing has been reported (Shayer & Adey, 1981). These correlations indicate an association but do not show the nature or extent of the differences within the association. This difference and its direction was obvious from the first level of analysis which indicated that individual tasks are assessing children at a higher level at 28 out of 35 comparison points and that group tasks did not assess children higher even at a single point. However, in order to carry the argument further it was decided to find out significance of difference of means between results of group tasks and individual tasks. T-Test procedure of SPSS was used to assess the significance of difference between results of group versus individual tasks. However, keeping in view the limitations of *t* Test, Non-parametric Tests available on SPSS were also used to further verify the significance of difference between the means. Therefore, an intuitive as well as statistical decision can be made to adopt individual tasks rather than group tasks for obtaining optimum levels of cognitive development of secondary school children in Pakistan. Economy of collecting data through group tasks and a number of other arguments in favour of group tasks (such as comparatively more objectivity and standardization of procedure) could have made it a difficult decision but the researchers could not ignore their experiences of administering group tasks in the classroom.

Administration of Group Tasks in Classroom

Differences in cognitive levels of children obtained through group tasks and individual interviewing eventually determined the decision to abandon group tasks. Nevertheless, one important question remains to be answered. Why it was not possible to use group tasks in secondary schools of Pakistan while the same

tasks worked very well in England and proved very useful in collecting data on cognitive levels of secondary school children at a large scale (Shayer & Adey, 1981).

With hindsight developed only after going through the experience of repeated efforts to administer group tasks, one can list underlying assumptions in the development of class tasks by CSMS.

(1) Students in the classroom are familiar with the apparatus being used in administering these tasks.

(2) Students, as a group, can follow instructions step by step and can go along the experimenter in the administration of the task.

(3) They can locate appropriate places on their record sheets for recording their responses.

(4) They will evoke their cognitive ability in answering the questions of the tasks.

NIP research team noticed the following during its experience of administering group tasks in classrooms.

(1) All the apparatus used during administration was ordinary secondary school science apparatus. However, in most of the cases, it was being seen for the first time by students. Cylinders, beakers, solid cube, trough, etc., were unfamiliar objects for the students. They faced difficulty in relating these objects to their diagrams and names written in their record sheets.

(2) They were not well versed in basic units of measurement. It was noticed repeatedly that they had no idea what a cubic centimeter was.

(3) They were finding it difficult to keep a track of pages and columns of their record sheets. They had, by and large, a tendency to keep on flipping their record sheets. It was very difficult to keep all the children together within the different stages of a

(4) Despite best efforts of the researchers, the class as a group was unable to communicate at the required level. For instance, they very rarely asked questions to clarify any points regarding the procedure or record sheets of tasks. Scrutiny of the sheets clearly indicated that they remained confused about the task. It appeared that the class was determined not to ask anything. They had a tendency to nod their heads in affirmation without really meaning so.

(5) There was a very rigid tendency to produce a correct answer without really trying to solve the question. A strong reluctance to invoke thinking was evident. In some areas the correct answers would have come from some evidence recorded in some previous column of the record sheet. However, somehow or other, they were convinced that the answers do not lie within some recorded evidence. For them the source of answers was neither their own thought process nor some evidence within the task. It appeared that for them the only source of knowledge was some previously told solution.

(6) There was a strong tendency of not committing their answers on paper. Therefore, they delayed writing answers as much as possible. It became very difficult to stop them from trying to confirm their answers from their class-mates. Many of them, instead of trying to think what may be the correct answer, just tried to copy it from someone else. They were told that if they wanted to change their answer they should merely strike out their previous answer and write their alternative answer. However, most of them rubbed out their previous answer and attempted over-writing instead of rewriting.

(7) They were given very clear instruction that these tasks had nothing to do with their academic tests or examinations. However, the researchers could not succeed in reducing their test anxiety. For instance, in the task of Volume and Heaviness, students were asked to guess a certain answer. Correct answer was not expected at this stage as evidence for the correct answer was not available. Once they had written

their guessed answer they were told that their answer was not expected to be correct because correct answer could not be derived from the information given so far. Therefore, whatever they had written they should leave it as such. Then they were given data which could provide basis for arriving at a correct answer. Now they were asked to write down their answer again, without trying to correct or rub off their previous answer which was not expected to be correct. It was noted that despite clear instructions 80% of students rubbed off their previous answers and wrote new answers.

CONCLUSION

Piagetian method of an open-ended interview with the child, despite certain obvious limitations, continues to be the best method of evoking optimum level of cognitive functioning in a child. This method is expensive on time and data generated by it yield to statistical analysis with great difficulty. It proves specially problematic where one is interested in a normative study. The researcher is compelled to keep the size of sample limited. However, one can go for group cognitive tasks. Their significantly positive correlation with classical Piagetian methodology can justify their use. Nevertheless, in the case of secondary school children in Pakistan, the group tasks tend to pose special problems. These problems can be ascribed to rather peculiar cognitive style of Pakistani school children. In the present context, it appears that this cognitive style hampers children's ability to invoke their cognitive structures. Children's poor performance through group tasks is result of their faulty cognitive style rather than their retarded cognitive abilities. This needs further investigation and elucidation. Poor performance in cognitive group tasks is a very minor issue. If such a style persists in other areas as well, this can be a very serious handicap for the total intellectual life of children.

This cognitive style can be a direct result of teaching practices of our schools where children are discouraged to invoke their own abilities for problem solving and for answering routine questions. This leads to a cognitive pattern which was so clearly noticed during administration of cognitive group tasks and has been described above. Physical facilities in the classrooms,

children's lack of exposure to regular school science apparatus is also a contributing factor but it is the teaching style which makes the children behave in a very inadequate manner. Piagetian method of critical interviewing is capable of transcending the limitations of children's cognitive style. By using the advantage of open-ended interview in one-to-one interaction, a researcher can successfully encourage and provoke a child to invoke his/her cognitive abilities at the optimum level.

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