CHAPTER FIVE

RELATIONSHIP OF CREATIVITY AND INTELLIGENCE WITH ACADEMIC ACHIEVEMENT
Product-moment correlations between the predictor variables involving the measures of creativity and intelligence, and the criterion variable of achievement in different subjects were computed with two purposes in view; firstly, to find out the analytical picture of relationship between different creativity components and intelligence on one hand and achievement in different subjects on the other at concrete and formal operational stages, and secondly, to compare the nature of relationship between the above variables at concrete stage with that of formal stage. The relevant hypotheses which were tested with the help of the above analyses as mentioned earlier in chapter II are being reproduced below:

1(a) Creativity and achievement correlate significantly and differentially in different teaching subjects at school level.

1(b) Intelligence and achievement correlate significantly and differentially in different teaching subjects at school level.

2(a) Creativity and intelligence are differentially related to achievement in different subjects.
2(b) The relationship of creativity and intelligence with achievement differs at concrete and formal operational stages.

For the simple reason of convenience the relationships between the above combinations of variables have been discussed under two separate headings i.e. 'Creativity and Achievement' and 'Intelligence and Achievement'.

PRODUCT-MOMENT CORRELATIONS BETWEEN CREATIVITY AND ACHIEVEMENT

CONCRETE STAGE:

Table 5.1 reveals the 'r' values between creativity and achievement at concrete operational stage.

Table 5.1
Product-moment correlations between Creativity and Achievement, and between Intelligence and Achievement at Concrete Operational Stage (N=461)

<table>
<thead>
<tr>
<th>Predictor Variables</th>
<th>Social Studies</th>
<th>Science Achievement</th>
<th>First Achievement</th>
<th>Language Achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal Creativity</td>
<td>.536**</td>
<td>.377**</td>
<td>.448**</td>
<td></td>
</tr>
<tr>
<td>Verbal Fluency</td>
<td>.381**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verbal Flexibility</td>
<td>.302**</td>
<td>.310**</td>
<td></td>
<td>.404**</td>
</tr>
<tr>
<td>Verbal Originality</td>
<td>.572**</td>
<td>.383**</td>
<td></td>
<td>.471**</td>
</tr>
<tr>
<td>Total verbal creativity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Figural Creativity</td>
<td>.399**</td>
<td>.176**</td>
<td></td>
<td>.270**</td>
</tr>
<tr>
<td>Figural Fluency</td>
<td>.416**</td>
<td></td>
<td></td>
<td>.315**</td>
</tr>
<tr>
<td>Figural Flexibility</td>
<td>.304**</td>
<td>.260**</td>
<td></td>
<td>.246**</td>
</tr>
<tr>
<td>Figural Originality</td>
<td>.287**</td>
<td>.439**</td>
<td></td>
<td>.180**</td>
</tr>
<tr>
<td>Figural Elaboration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total figural creativity</td>
<td>.374**</td>
<td>.221**</td>
<td></td>
<td>.283**</td>
</tr>
<tr>
<td>Verbal Intelligence</td>
<td>.577**</td>
<td>.500**</td>
<td></td>
<td>.575**</td>
</tr>
<tr>
<td>Non-verbal Intelligence</td>
<td>.304**</td>
<td>.173**</td>
<td></td>
<td>.219**</td>
</tr>
</tbody>
</table>

Note:
1. ** indicates values significant at .01 level
2. Value significant at .01 level = .120
It is obvious from the values of coefficients of correlation entered in table 5.1 that all the measures of verbal creativity, namely, fluency, flexibility, originality as also total verbal creativity exhibited significant correlations at .01 level with achievement in social studies, general science and first language. For Achievement in general science significant values of correlations appeared to be equal to .377 for verbal fluency, .399 for verbal flexibility, .310 for verbal originality and .385 for total verbal creativity. The maximum 'r' values of achievement in social studies has been presented by verbal flexibility (r = .584) and least by verbal originality (r = .502), the other values of correlation being .572 for total verbal creativity and .536 for verbal fluency. Achievement in language too, yielded significant 'r's of the values of .480, .471, .448 and .404 in descending order with verbal flexibility, total verbal creativity, verbal fluency and verbal originality respectively.

In the light of the significant correlations obtained between all the sub-scores on figural creativity and achievement in different subjects it may be pointed out that out of all the subjects achievement in social-studies was associated most with figural creativity variables expressing the range of .221 to .416. The highest 'r' value out of all the figural creativity measures with social studies achievement has been attributed
to flexibility \( (r = .416) \) followed by fluency \( (r = .399) \),
total figural creativity \( (r = .379) \), figural originality
\( (r = .304) \) and figural elaboration \( (r = .221) \). Similar trend
of relationship has been manifested by figural creativity and
language attainment, the corresponding \( 'r' \) values being .315,
.284, .270, .246 & .180 for figural flexibility, totals,
fluency, originality and elaboration respectively. With
achievement in general science the values of .176, .260, .205,
.143 and .221 has been exhibited by fluency, flexibility,
originality, elaboration and totals respectively, all significant
at .01 level.

The present results amply demonstrate the trends
wherein, (a) both verbal and figural creativity have been
found to be significantly related to achievement in all the
three subjects, (b) relationship of verbal and figural
creativity is most favourable for achievement in social
studies to be followed by first language and general science,
(c) in comparison to other creativity dimensions flexibility
correlates slightly higher with performance in various
academic subjects (d) the magnitude of correlations between
figural creativity and achievement in various subjects as
compared to verbal creativity and achievement is considerably
low.

These findings permit us to infer that all these
subjects have an element of creativity built in them, more
especially in the domains of social studies and language.
The efficiency of producing responses in examinations
concerning these areas largely depend upon the variety as
well as retrieval recall of associations, critical appreciations
as also the fluency of ideas, and, finally the structuring
and integration of these ideas. These abilities to a large
extent are manifested in creativity tests also. On the other
hand, performance in science at concrete state, because of
the very structure of the discipline, stresses to a large
extent abilities like recognition of principles, objectivity
and exactness of presentation of analysis, than original
and independent thinking abilities. More so, majority of
classroom situations in this discipline and teaching procedures,
as in practice, emphasize the acquisition of principles and
facts, leaving less scope for independent thinking and
productivity. The closer affinity of creativity measures
to achievement in humanities than to achievement in science
is not an unusual phenomenon. Evidence that divergent
bias is more related to performance in arts than to science
attainment has already been demonstrated by Hudson (1966,1968),
Child (1969), Mackay and Cameron (1966), Copley and Field
(1962), Kinsbourne (1968), Heim (1970); Rump and Lunn (1971),
Child and Smithers (1973) and Salby and Bostock (1973).

While observing the intricacies involved in the
relationship of verbal and figural creativity with academic
achievement, it is apparent that out of all the verbal creativity measures flexibility has slightly more to contribute for the performance of students consistently in all the three subjects i.e. social-studies, general science and first language. In other words, any increase in the scores of verbal flexibility is liable to result in corresponding increase in achievement in the above subjects. The variations in other dimensions of verbal creativity also manifest corresponding significant variation in academic scores but such correspondence is not as high as in case of verbal flexibility.

The analytical picture of figural creativity dimensions and achievement is highly similar if not identical to the one obtained between verbal creativity and achievement. Figural flexibility like verbal flexibility as compared to other figural creativity dimensions has revealed maximum relationship with achievement in first language and general science though for achievement in social-studies both figural fluency and flexibility correlate almost equally. Comparisons across academic subjects show that for language attainment, the maximum contribution made by flexibility has been followed by figural fluency, figural originality and figural elaboration. For social studies, the dimensions of figural originality and figural elaboration come next to figural flexibility and figural originality in relating to its achievement, whereas, for achievement in general science the descending order in which figural creativity dimensions
contribute is: flexibility, originality, fluency and elaboration. Thus, the dimension of elaboration in figural creativity tests, though significantly related with all the three subjects, makes minimum contribution when compared to other figural creativity dimensions.

The phenomenon of observed verbal and figural flexibility facilitating achievement in various scholastic areas to be followed by fluency, and also figural elaboration having comparatively lesser effect on achievement than other dimensions is suggestive of the fact that due to the paucity of time, teachers while marking answer sheets prefer the varied responses given under clear-cut headings than to those presented elaborately in prose form which take more time for correction. The more the specification provided to different relevant responses by the students the better are their grades in examination. Thus, their ability to think in varied classification in respect to numerous ideas help them in achieving better grades in school subjects.

In general, the findings of significant correlations between creativity and language achievement go parallel with the findings of Sandifer (1973), Garhart (1976) and Marjoribanks (1976): of significant correlations between creativity and social-studies achievement with Parmesh's (1973) findings; and of creativity having significant relationship with science achievement with the results
given by Sandifer (1973) and Marjoribanks (1976). However, Starr & Nicholl (1975) present their conclusions which are in odd with these results showing that creativity has no relationship with achievement in physics.

FORMAL OPERATIONAL STAGE

The values of correlation between creativity and achievement at formal operational stage have been given in table 5.2.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Achievement Social Studies</th>
<th>Achievement General Science</th>
<th>Achievement First Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal Creativity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verbal Fluency</td>
<td>.369**</td>
<td>.445**</td>
<td>.399**</td>
</tr>
<tr>
<td>Verbal Flexibility</td>
<td>.401**</td>
<td>.412**</td>
<td>.402**</td>
</tr>
<tr>
<td>Verbal Originality</td>
<td>.405**</td>
<td>.405**</td>
<td>.421**</td>
</tr>
<tr>
<td>Total Verbal Creativity</td>
<td>.425**</td>
<td>.456**</td>
<td>.441**</td>
</tr>
<tr>
<td>Figural Creativity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Figural Fluency</td>
<td>.223**</td>
<td>.278**</td>
<td>.182**</td>
</tr>
<tr>
<td>Figural Flexibility</td>
<td>.171**</td>
<td>.230**</td>
<td>.169**</td>
</tr>
<tr>
<td>Figural Originality</td>
<td>.149**</td>
<td>.260**</td>
<td>.172**</td>
</tr>
<tr>
<td>Figural Elaboration</td>
<td>.214**</td>
<td>.217**</td>
<td>.212**</td>
</tr>
<tr>
<td>Total Figural Creativity</td>
<td>.225**</td>
<td>.291**</td>
<td>.220**</td>
</tr>
<tr>
<td>Verbal Intelligence</td>
<td>.677**</td>
<td>.606**</td>
<td>.609**</td>
</tr>
<tr>
<td>Non-verbal Intelligence</td>
<td>.363**</td>
<td>.345**</td>
<td>.353**</td>
</tr>
</tbody>
</table>

Note:

** indicates values significant at .01 level.
Value significant at .01 level = .116
Measures of verbal creativity exhibit significant correlations within the range of .405 to .458 (vide table >2). These correlations include values of *r* being .405 for verbal originality, .412 for verbal flexibility, .445 for verbal fluency, and .458 for total verbal creativity. Achievement in first language also correlated significantly with verbal fluency (r = .402), verbal flexibility (r = .402), verbal originality (r = .424), and total verbal creativity (r = .441). In respect of social studies achievement, it was found that it yielded significant positive correlations at .01 level with verbal fluency (r = .389), verbal flexibility (r = .389), verbal originality (r = .401), and total verbal creativity (r = .441). These results suggest a strong relationship between verbal creativity and academic achievement. It has been established that there exists significant positive correlations between all the measures of verbal creativity and achievement in social studies, general science, and first language at .01 level. The highest correlation (r = .42) was found between total verbal creativity and achievement in first language. The correlation between the three subjects is significant at .01 level.

Referring to figural creativity in table 5, it has been established that there exists significant correlations between all the measures of figural creativity and achievement in social studies, general science, and first language at .01 level. The highest correlation (r = .291) was found between achievement in general science and total figural creativity. Achievement in first language also correlated significantly with figural creativity, with the highest correlation being .217. The correlation between verbal creativity and figural elaboration (r = .10) and total figural creativity (r = .13) also shows a positive correlation.

Other dimensions of creativity were also considered. It was found that measures of figural creativity were significantly correlated with achievement in general science, verbal creativity, and total verbal creativity. Achievement in first language also correlated significantly with figural creativity, with the highest correlation being .217. The correlation between verbal creativity and figural elaboration (r = .10) and total figural creativity (r = .13) also shows a positive correlation.
that is, figural fluency, flexibility and originality show the values of .275, .230 and .200 respectively with science achievement. Achievement in social-studies and first language don't vary much from each other in their range of correlations with figural creativity, which is .149 to .225 for social-studies and .169 to .230 for first language. In case of achievement in social-studies the values in descending order are .225, .223, .214, .171 and .149 for total figural creativity, fluency, elaboration, flexibility and originality respectively. On the other hand, for achievement in first language, the order presented is total figural creativity, figural elaboration, fluency, originality and flexibility showing the corresponding values to be equal to .220, .212, .182, .172, .159 for these variables respectively.

From the above correlations of creativity with academic achievement in different subjects at formal stage, the trend of results depict that; (a) various dimensions of verbal and figural creativity related significantly to achievement in all the three subjects, (b) verbal creativity more than figural creativity affected achievement in various school subjects, (c) academic achievement in all the three subjects i.e. social-studies, general science and first language revealed almost similar values of correlations with the measures of creativity, (d) figural fluency and figural elaboration related more to achievement in social-studies than figural flexibility and figural originality;
and figural elaboration, out of all the dimensions of figural creativity related most to achievement in first language, though for achievement in general science almost similar values appeared with figural creativity measures. (e) In case of both verbal and figural creativity tests, the summed scores have shown higher 'r' values than their components with all the three subjects.

The phenomenon of significant correlations between creativity and academic achievement and that of verbal creativity contributing more than figural creativity had appeared at concrete operational stage also, therefore, the arguments presented therein (pp. 122, 21) explain the appearance of such results at formal operational stage. Further, total creativity scores having higher 'r' values than their components may be because of the increased range of scores resulting out of the cumulative effects of subscores and also partly because of the reason that all the measures of creativity have significant correlations with achievement level in different academic areas at .01 as is evidenced by table 52.

The reasons for almost equal association of creativity with achievement in all the three subjects under consideration at formal operational stage has been explained where the correlational picture between creativity and achievement at both the operational stages has been compared for studying
the hypothesis 2b(p.127).

Another trend which has emerged at formal operational stage is that, at this stage figural elaboration yields highest 'r' values whereas at at concrete operational stage flexibility had submitted the greatest 'r' values. This may be possibly because of the reason that as students go into the higher classes, the quality of their answers in examination is more judged by how well they can explain (that is, elaborate) their viewpoint rather than by the greater number of points (headlines) as is done in lower classes.

When viewed in the light of hypothesis 1(a) that 'creativity and achievement correlate significantly and differentially in different subjects at school level' the present results demonstrate that the hypothesis of significant relationship has been confirmed at both the operational stages as all the 'r' values between these variables appeared to be significant at .01 level. These results are not unusual as there are references of several other studies wherein, significant correlations between creativity and achievement have been reported (e.g. Bish, 1960; Bowers, 1960, 1964; Ohmsacht, 1966; Hudson, 1966; Hasan and Butcher, 1966; Gibson and Light, 1967; Raina, 1968; Konchaveersiah, 1968; Nuttall, 1970; Greenberger et al., 1971; Passi, 1971; Feldhusen, Treffinger, Von Kondfrans and Ferris, 1971; Murphy, 1973; Shibuya et al., 1973; Crawford, 1974; Russell, 1975; Patel
and Joshi, 1978; Sandhu, 1979 and Gakhar and Behal, 1980).

The later part of the hypothesis 1(a) relating to the differential relationship between creativity and achievement in different school subjects has been retained only at concrete operational stage, wherein, achievement is social-studies has shown highest relationship with creativity to be followed by achievement in first language and general science. At formal operational stage creativity has been found to be almost equally related to all the three subjects.

PRODUCT-MOMENT CORRELATIONS BETWEEN INTELLIGENCE AND ACADEMIC ACHIEVEMENT

CONCRETE STAGE

Verbal intelligence yielded significant positive correlations at .01 level with academic achievement in social-studies (r = .572, vide table 5.1), first language r = .555) and general science (r = .500). Not much variations exist in the 'r' values of verbal intelligence and different achievement areas. However, differential trends of relationship are viewed when verbal intelligence is replaced by non-verbal intelligence. The maximum correlation here has been shown by achievement in social-studies (r = .304) to be followed by achievement in first language (r = .249) and general science (r = .173).
Results in table 5.1 further reveal the trend, wherein verbal intelligence than non-verbal intelligence contributed more towards achievement in various subjects. Such a phenomenon might have appeared because both verbal intelligence and achievement tests are characterized by speed factor. Greater the speed of right responses higher would be the performance on verbal intelligence test. The same analogy holds true with the accomplishment of achievement tests, where large number of response situations corresponding to different sets of ideas are to be presented in a limited time permitted for the examinations. The present results are not unusual. Evidence that verbal intelligence tests contribute more towards achievement than non-verbal tests has already been demonstrated by William, Davis and Donald (1972) and Kohli (1976).

While comparing the analytic picture of results of verbal and non-verbal intelligence with achievement to the one already obtained between verbal and figural creativity and achievement at concrete stage, it is witnessed that verbal tests of creativity too had higher 'r' values with achievement than figural tests. This phenomenon of verbal tests - both creativity and intelligence having higher relationship with achievement than non-verbal tests may be explained by stating that verbal tests so largely demand the use of verbal skills and conceptualization in solving them. This conceptualization is likely to be influenced by the
linguistic development of the child. As he himself uses language, as those around him, speak to him, and as their behaviour is permeated with language, to that extent he will be influenced to use language in solving problems. As a result, scores on verbal tests must in some measure reflect linguistic development underlying the language used as a medium of expression in the performance of verbal intelligence and verbal creativity tests and too is the main component of performance in the scholastic areas.

The above findings when studied in the light of the hypothesis 1(b) that "intelligence and achievement correlate significantly and differentially in different subjects at school level" indicate that the hypothesis has been confirmed in case of significant relationship between intelligence and achievement in all the three subjects but regarding the differential nature of correlations, the results permit its acceptance only in case of non-verbal intelligence.

FORMAL OPERATIONAL STAGE

Intelligence, as measured by the verbal tests depicted significant correlations at .01 level with achievement in social-studies ($r = .677$, vide table 5.2) general science ($r = .606$) and first language ($r = .609$) at formal operational stage. Similarly, the measure of non-verbal intelligence exhibited significant relationship at .01 level with achievement in social-studies, general
science and first language by revealing corresponding 'r' values equal to .363, .345 and .333 respectively. Thus, intelligence may be considered as a correlate of academic achievement with regards to such measures as included in the present study.

The important trend, that has emerged, from the relationship of intelligence with different school subjects at formal operational stage is that both verbal and non-verbal intelligence have correlated almost equally to achievement in all the three subjects. This trend does not fall in line with the expected nature of results based on the assumption of specialization of abilities with the advancement of age (Thorndike, 1930; and Anastasi, 1930). If this was true then the relationship of intelligence would have revealed greater degree of differentiation with different achievement areas from concrete to formal operational stage. The present results, thus, clearly indicate the generalization of abilities in their functioning in influencing academic achievement rather than their specialization with the advancement of age and, support almost similar findings by Doppelt (1950), Hofstaetter (1954), Russell (1965), Hundel (1965, 1969) and Cakhar (1973), suggesting either stability or increase in the general factors of intelligence with the increase in age.

At formal operational stage hypothesis 1(b) that "intelligence and achievement correlate significantly and
differentially in different subjects at school level", therefore, stands accepted only for its significant relationship between intelligence and achievement in various school subjects. With regards to differential relationship between these variables, the present results do not permit its acceptance as all the subjects appear with nearly equal values of correlations.

COMPARISON OF CREATIVITY-ACHIEVEMENT AND INTELLIGENCE-ACHIEVEMENT RELATIONSHIP AT CONCRETE AND FORMAL OPERATIONAL STAGES

When the relationship of creativity and achievement in different subjects at concrete operational stage is compared to those obtained between intelligence and achievement, it is observed that achievement in general science and first language are more related to verbal intelligence in comparison to verbal creativity though achievement in social studies is equally associated with both verbal creativity and verbal intelligence. Non-verbal intelligence, on the other hand, reveals almost similar 'r' values with achievement in various subjects to those found between figural creativity and achievement in these subjects except for the achievement in general science which reveals higher association with figural creativity as compared to non-verbal intelligence.

At concrete operational stage, part (a) of the second hypothesis that "creativity and intelligence are differentially related to achievement in different subjects", therefore, stands partially accepted.
The same hypothesis when examined at formal operational stage, reveals that the present findings lend full support for its acceptance as the relationship of intelligence with achievement, consistently speaks of higher association with all the three subjects than the measures of creativity. Such a picture might have emerged because of the reason that the abilities involved in the superior performance in examinations at the high school stage, in general require greater convergent thinking patterns and call for the reproduction of the previously learnt information - all too efficiently - to demigrate ones own problem solving abilities and imagination. The examination system puts comparatively more premium on memory and factual knowledge and the students are less rewarded for their creative responses, where they branch out from the known and conventionally accepted to make combinations of ideas which are originally adaptive to some problems and which could be predicted in advance simply through a thorough knowledge in the area under consideration. Such divergent thinking is said to be going beyond the given information (Bruner, 1967). Our schools in general, have perpetually directed themselves more in providing information in which situation the ideas of creative persons are quite often given lesser appreciation. The intolerance shown by the teachers towards divergency compel the
child to repress his creative abilities in lieu of social acceptance. Thus, the conventional educational system is mostly antipathetic to divergers and hence jeopardise the creative talent. It mainly aims to bringing up conformists (Ebel, 1969; Gertzels and Jackson, 1962; Lefrancois, 1972; Ahmed and Jafri, 1973; Khire, 1977; and Cropley, 1976). Teaching procedures as well as educational measurement system invariably don't stimulate and tag the creative talent as much as their responses in the form of accepted and already established facts or laws. The attention is focussed more on consolidating the known information and being able to reurgitate it. According to Rao & Rao (1976), most of the examinations judge IQ of the students. They also suffer from the same cultural bias as most of the IQ tests do. Largely due to this bias, we miss a large number of creative students who are unable to respond to questions in the required manner because of various external constraints such as different cultural milieu, immediate environment and lack to opportunities to develop examination skills.

To conclude the above arguments, the appearance of relatively low correlations between creativity and achievement in comparison to intelligence and achievement may be due to the inherent educational and measurement characteristics of prevalent examination system. Had our educational practices been more progressive the examination scores might have yielded correlation values with creative abilities.
Comparisons of correlations between creativity and achievement at concrete operational stage with those revealed at formal operational stage, show differences in the sense that the degree of relationship of both verbal and figural creativity decreased from concrete to formal stage for achievement in science and increased for achievement in general science thus leading to the non-differential nature of relationship of creativity with achievement in different subjects, which was differential at the concrete stage. Such findings may be explained in terms of the such intellectual operations at formal operational stage as combinatorial logic and ability of proportionality, and also due to the fact that at this stage the individual becomes capable of reasoning by using different systems of reference simultaneously which remain flexible and can be elaborated indefinitely. He can formulate hypotheses and can deduce consequences from them. The development of these intellectual skills seem to play a role of significance in the performance of creativity tests e.g. Guessing Causes - Activity II and Consequences - Activity III of the verbal tests of Creative Thinking; and to a large extent are also required for better achievement in science also, where the individual hypothesizes concerning some scientific problems and tries to solve them experimentally. Achievement in social-studies, at formal stage, on the other hand, seems to be affected more by abilities other than measured
by the verbal and figural creativity tests, thereby lowering the correlation when compared with those obtained at concrete operational stage.

To conclude, the correlations of verbal and figural creativity with achievement in different subjects, in general, have been revealed to be higher at concrete stage than at formal operational stage. This may be because of the reason that when the child reaches formal stage he comes under increased pressures to conform to the patterns of his peer groups. The pressure for conformity which is also required more and more in the examination papers, leads the child to loose his tendency for individual creative thinking.

Likewise, the comparison of correlational picture of intelligence with achievement at concrete and formal operational stages depict (a) that the relationship between the two variables under consideration is higher at formal operational stage, and (b) that non-verbal intelligence which was differentially related to achievement in different subjects at concrete operational stage shows almost equal 'r' values at formal operational stage with all the three achievement areas. The reasons for the appearance of such trends have already been explained in the preceding discussions (pp. 125&123) therefore, have intentionally been avoided here.

From the arguments presented above it may be stated that part (b) of the second hypothesis, that "the relationship of creativity and intelligence with achievement differs
at concrete and formal operational stages" holds tenable.

To sum up, the results of correlations between the measures of creativity and achievement, as also between intelligence and achievement demonstrate that -

(1) Both creativity and intelligence are significantly related at .01 level to achievement in all the three subjects, namely, social-studies, general science and first language across both the operational stages - concrete and formal. Hence, creativity and intelligence may be considered as correlates of achievement in the above subjects.

(2) The values of correlation between intelligence and achievement, in general, are higher when compared with those between creativity and achievement. This is true for (i) both concrete and formal operational stages, and (ii) all the three teaching subjects, that is, social-studies, general science and first language, except for achievement in social-studies at concrete operational stage which is almost equally related to both creativity and intelligence.

(3) Verbal creativity shows higher degree of association with achievement than figural creativity. Likewise, verbal intelligence in comparison to non-verbal intelligence reveals higher association with achievement in different subjects.
(6) 'Flexibility' of verbal and figural creativity, at concrete operational stage is slightly more related to academic achievement than other dimensions of these tests. No consistent picture of correlations between different dimensions of creativity and achievement emerges at the formal stage.

(5) Of all the teaching subjects, at concrete operational stage, achievement in social-studies shows highest correlations with creativity to be followed by achievement in first language and general science. While, at formal operational stage, achievement in social-studies, general science and first language appear with almost equal values of correlation, thus suggesting that creativity, which is differentially related to achievement in different subjects at concrete stage, relates almost equally to all the three subjects at the formal operational stage.

(6) Achievement in social-studies reveals higher association with creativity at concrete operational stage than at formal operational stage, while achievement in general science is more related to creativity at formal operational stage than at concrete operational stage.

(7) Verbal intelligence, at both the operational stages relates almost equally to achievement in different
subjects, whereas, non-verbal intelligence at concrete operational stage is more related to social-studies and least to achievement in general science though at formal operational stage no such differences in relationship were observed.

(8) Intelligence, in general has appeared with higher 'r' values with achievement in different school teaching subjects at formal operational stage as compared to concrete operational stage.

Thus, the empirical validity of obtaining intellectual and creativity correlates of achievement is established beyond chance fluctuations, which speaks of thinking in terms of common elements which favoured both the intellectual and creative abilities towards academic achievement. This phenomenon can better be understood if intelligence is thought of broadly speaking in terms of reasoning, speed-perceptual and motor, speed in organizing and integrating thoughts and ideas, funded capital of diverse and varied information characterized by enriched amount of knowledge—longitudinally and vertically and the like, and creativity is perceived as an ability to think in terms of producing original, varied, elaborated and multitude of ideas. Beyond doubts, both these abilities involving above factors are almost equally potent in explaining the variance in performance in academic areas. Undoubtedly, the range of correlations is not very high, nevertheless, the fact remains that
intelligence and creativity do appear as correlates of achievement which cannot be thought of merely in terms of chance.