DISCUSSION OF RESULTS.

Discussion of results is primarily based on significant interactions. It is presented in two phases. Phase I consists of discussion of the laboratory learning task (concept formation) and Phase II consists of discussion of school learning in real-life setting i.e., academic achievement.

PHASE I

Interactive Effects of Anxiety and Intelligence on Learning (Error):

Two factorial analyses have had been done to find out whether variations in anxiety and intelligence affect learning. One analysis was done on the raw scores which consisted of errors made by each subject while learning the concept formation task. The second analysis was done on the total number of trials taken by each subject in the learning situation. The results of the two analyses were discussed separately.

It was hypothesized that the performance of high test-anxious persons would be relatively lower to that of their low-anxious counterparts. The present findings supported this hypothesis. The mean number of errors made by the HA Ss was 51.36, while the mean number of
errors made by the LA Ss was 42.63 (Table 1.1). The trend in the means suggested that there was some difference in the performance of LA and HA Ss, but the F value (2.153, n.s.) did not reach statistical significance indicating that variation of anxiety did not have a significant effect on the dependent variable. The trend of the means (Table 1.1) however, indicated differences in the expected direction between the performance of low and high test anxious Ss. Studies by Sarason, 1960; Wine, 1971, Phillips, 1972; Sarason, 1980 showed similar results.

There is evidence (Sarason, 1956, 1957; Sarason and Minard, 1962; Hill and Eaton, 1971) indicating that anxious children perform poorly on cognitive and ability tests because of motivational difficulties rather than of learning or ability deficiencies. In the present study the variable of intelligence was controlled. The results still revealed a debilitative effect of HA on learning, (Table 1.1, 1.2).

Results pertaining to the effect of intelligence on learning were in the expected direction. HI Ss performed better than LI Ss on the concept formation task
Mean number of wrong responses indicated that the magnitude of difference was significantly large between the two intelligence levels. LI Ss' mean number of wrong responses was 65.53, while that of the HI Ss was 30.46 (Table 1.1), clearly indicating that the performance of LI Ss was twice as poor as that of HI Ss (Fig.1.1).

The findings of the present study are supported by numerous other researches. Stevenson, Klien and Miller (1968, 1970) obtained significant correlations between laboratory tests of learning with intelligence. Some of the studies reported positive relation of IQ and performance in a laboratory learning task (Ring and Palermo, 1961; Iscoe and Sembler, 1964; Rieber, 1964, Rapier 1968; Crallagher, 1969 and Vibha 1972).

The interactive effects of anxiety and intelligence were found to be insignificant (Table 1.0). However, trends in learning scores revealed, according to prediction made at the beginning of the present study that, on the whole LA-HI Ss perform better than HA-HI Ss. Similarly, at LI level, LA Ss performed slightly better than HA Ss. However, the differences in performance of HI and LI groups at both the anxiety levels were not significant (Table 1.0,1.2).
According to Yerkes - Dodson law (1908) the effects of anxiety were more marked only in the middle range of intelligence, where ability to perform was neither limited nor extensive. In case of extremes of ability, as in the present study, anxiety effects were counterbalanced by the prepotence of intellectual factor. This had been found by Spielberger and Katzenmayer (1959), Klugh and Bendig (1955), Spielberger (1958), Ruebush (1960), Sharma (1973), and Ravinder (1977).

Intractive Effects of Anxiety and Intelligence on Learning (Trials):

A second analysis was based upon the number of trials taken by each subject, as the dependent variable. The effect of anxiety was found to be significant (F value 4.99, p .01) (Table 1.3). The LA Ss took fewer trials (5.3) than their HA counterparts, indicating that high test-anxious students needed to make more efforts in learning a new task due to the debilitating effects of test anxiety (Table 1-4).

It was reported in various researches that the 'worry' and 'emotionality' components of test anxiety
contribute to reducing the achievement of test-anxious students in intelligence tests and learning tasks: worrying thoughts distract the individual's attention from the task, and intense emotional reaction lead to mistakes and cause repression that blocks memory (Sarason 1980; Wine 1971).

Debilitative effects of anxiety on concept learning were also reported by Denny (1966) and Forbes (1969). Studies using different learning tasks have also shown similar results (Spence, 1958; Taylor, 1958; Taylor and Chapman, 1955; Stevenson and Odom, 1965).

The finding that anxiety lowered the performance of a high test-anxious group in contrast to a low test-anxious group was in conjunction with the hypothesis made at the beginning of the present study. It was also hypothesized that HI Ss would perform relatively better than LI Ss irrespective of their anxiety level. The analyses which had been done on the two dependent variables in the learning task i.e., mean number of errors and mean number of trials taken, supported this hypothesis. In both the analyses, the differences in the performance of LI and HI Ss were statistically significant (Tables 1.0, 1.3).
The learning task, i.e. Concept Formation Test used in the present study, was more meaningful as compared to other laboratory learning tasks. It is therefore, not altogether surprising that performance of high intelligence Ss was significantly better than LI Ss.

No significant interactive effect was found between anxiety and intelligence on learning. The absence of statistically significant interaction usually means that any subsequent interpretation would generally focus on the marginal means rather than on the individual treatment means. Stated another way, the effects of one of the independent variables can be described and analyzed without considering the specific levels of the other independent variable.

In the present study, the main effect of anxiety was found to be statistically significant in one analysis and not significant in the second one. However, the trends in the means show that HA Ss made comparatively more errors and took more trials than their LA counterparts. The best performance was found to be in the LA-HI group. LA did not interfere in the "thought process" of
this group, thereby leading to better performance. HA, on the other hand had a debilitating effect on performance for both the intelligence levels. The absence of a significant interaction between these two independent variables indicated that there was "additive effect" in the analyses i.e., the effect of one variable simply added to the effect of the second variable (Keppel, 1982).

The lack of significant interaction could also be due to the counter-balancing of anxiety effects by the prepotence of intellectual factor, as established by Spielberger and Katzenmayer (1959), Ruebush (1960), Sharma (1973), etc. It could also be possible that extraneous variables such as sex, socio-economic status, self-concept, defensive pre-dispositions, motivation etc. had affected the test-anxiety and intelligence scores. It is not practical to suppose or assume that all factors affecting the dependent variable can be controlled in a single experiment. The most important factor affecting learning was intelligence, and that had been built into the design of the present study for controlling its effect.

On the basis of the results obtained in the present study, it could be concluded that the effects of
intelligence and anxiety on learning were significant and that there was no interactive effect between the two independent variables on learning.

**PHASE II**

**Interactive Effects of Anxiety (Test) and Intelligence on Academic Achievement.**

The hypotheses for academic achievement had been based primarily on Sarason's approach to test anxiety. Accordingly, it was expected that the performance of HA Ss would be relatively lower than their LA counterparts. Evidence supporting this hypothesis was found in the present study. It was also hypothesized earlier, that HI Ss would perform significantly better than LI Ss regardless of their anxiety level, and that there would be interactive effects of the two independent variables (i.e., test anxiety and intelligence) on the academic achievement of school children. The results of the present study supported and confirmed the hypotheses.

Interaction between anxiety and intelligence was found to be highly significant (Table 1.6, Fig 1.8). HA was found to be associated with greatest deficit for LI group. The HI group's performance also showed the debilitative effect of HA. The interactive effect of anxiety and intelligence reached a statistical signifi-
cance level at \( p = 0.01 \). Results supported the hypothesis and were consistent with Sarason's findings. Similar results were found for laboratory learning tasks (Denny, 1966; Katahn, 1966; Singhal, 1974; Basu, Kumar and Bose, 1979).

As expected, intelligence was found to have a pronounced effect on aggregate achievement. HI Ss, on the average, obtained more marks than the LI Ss. This indicated that intelligence was a very crucial factor in achievement and that performance in academic achievement was significantly related to intelligence. Very clear difference in the performance of the two intelligence groups (HI and LI) could be partially attributed to the fact that sample in the present study consisted range of Ss varying in intelligence level and selected Ss represented extremes of intelligence levels. However, significant main effect of intelligence supported the well-established positive relationship between intelligence and school achievement. (Fig. 1.6).

Effect of anxiety on academic achievement was statistically significant (Table 1.6). LA Ss performed relatively better than HA Ss. Several studies reported low negative but significant correlation between anxiety
scores and achievement measures (e.g., McCandless and Castaneda, 1956; Hefner and Kaplan, 1959; Cowen et al., 1965, Keller and Rowley, 1962; Phelps, 1968; Sinha, 1972). These findings were reported when MAS index was used. Similar results have been reported when other anxiety index such as TASC was used (e.g., Broen, 1959; Atkinson and Litwin, 1960; Sarason, 1963; Carrier and Jewell, 1966, Muroy, 1968; etc.).

The trend in the means indicated that the best performance was found to be in the LA-HI group. This group's performance was also found to be the best in the learning task. This clearly showed that LA aided in better performance. The performance of the HA-HI group was very low in comparison to the LA-HI group. It's mean number of marks obtained were 329.6 (Table 1.8, Fig 1.8) where as the mean number of marks obtained by the LA-HI group was 419.86. The "toppers" of the class were also found to be more in the LA-HI group than in the HA-HI group. This indicates that HA had debilitative effect on the academic achievement of many able students.

At the LI level, it was found that HA-LI Ss performed somewhat better than LA-LI Ss (Table 1.8) This can be explained in terms of Spielberger's extension of
Drive theory to incorporate intelligence. There was however, not a very large difference between the means of the two groups of LI (Table 1.7). It needs to be mentioned here that achievement in aggregate of school courses was an outcome of achievement in various school courses of simple as well as complex nature. Consequently, achievement in aggregate involves a multiplicity of skills and habits (Graudry and Fitzgerald, 1971; Spielberger and Weitz, 1966). Some of the conditions that had adverse effects on HA may have had facilitative effects on LA. So, the composite score might reflect the combined facilitative and debilitating effects of anxiety.

The present study's results indicate significant main and interactive effects of anxiety and intelligence on academic achievement. There are many other factors which affect academic achievement such as sex, parental relationships, school-curriculum, self-concept, socio-economic background et. These factors could be crucial in adding to anxiety in school situation.

**Over-view.**

Anxiety, as a main effect reached statistical significance except in the analysis of mean number of errors made in the learning task. The second dependent
measure in the learning task (i.e. number of trials taken by each subject) was however found to be significantly affected by anxiety.

The Test Anxiety Scale (Sarason, 1960) was used in the present study. Sarason (1963) had said that anxiety-intelligence relationship is a function of anxiety scale employed. Since TAS measures test anxiety specifically in academic achievement and learning situation, it can be concluded that the anxiety scores obtained were reliable and valid.

Another crucial point in anxiety research was that of proximity between the administration of anxiety scale and the examination. In the present study, anxiety scores were obtained almost 8 months after the annual examination was held, the marks in which form the achievement scores. This long gap might have obliterated the marked effects of anxiety that must have been felt at that particular time by the students.

Effects of anxiety also vary as a function of task difficulty. School work seems to be relatively more difficult for low aptitude students and easy for high aptitude students. Therefore, high-aptitude students obtain good grades, as compared to low aptitude students,
irrespective of their anxiety level. Further, within various school courses, nature and content of the course varies. School courses demanding higher cognitive skills are liable to produce many dominating error tendencies in HA students even at HI level.

Further, as reported by Mehrens and Lehmann (1980), it is "uncertainty" that makes students anxious. Teachers who "spring" tests on students without warning, teachers whose tests are so unpredictable that the students do not know what to expect, teachers who leave students "in the dark" as to what is expected of them, and teachers whose marking is based on whimsical grounds all create anxiety by their measurement incompetence.

Some studies have shown sex differences in academic achievement situations. Girls either experience more anxiety or give expression to it more freely than boys. Several findings have reported that test anxiety is significantly higher in females (e.g. Fittkau and Langer, 1974). The present sample consisted of 22 girls in the HA group (HI and LI, both are inclusive) and 13 girls in the LA group. The boys were found to be maximum in the LA group (i.e., 17 out of 30 Ss) and minimum in the HA group (8 out of 30 Ss). This indicated that sex differences
affected the anxiety scores. This variable had not been controlled in the design.

If the findings of laboratory learning and academic achievement were compared, there would be some similar findings as well as different ones. One of the aims of the present research had been to establish the potentiality of laboratory learning studies to real life learning situations. In the present investigation, anxiety was found to have a significant main effect in academic achievement and not in laboratory learning. However, one of the analysis on dependent measure of learning (i.e. mean number of trials taken) did indicate a significant main effect. Since the results of the two analyses of learning scores were confounding, it was considered practical and plausible not to arrive at any hasty conclusions. More effective and organized research should cover this topic.

Further, in laboratory, the situation is artificial and the anxiety is short term and abrupt, where as examination stress accumulates gradually over some period of time with the approaching examination. This gradual increment in stress makes anxiety effects more
pronounced in academic achievement situations.

Another possible reason for non-significant results for anxiety in laboratory learning situation was the fact that stress was not induced thereby no undue anxiety was provoked in the Ss. On the other hand, stress was inherent in the academic achievement situation leading to the pronounced effects of anxiety.

It was concluded that only intelligence had predictive efficiency in the present study. Combination of anxiety with intelligence appreciably and significantly affected academic performance. The present findings confirmed the earlier findings that high test anxiety does have a debilitating effect on academic achievement (Sarason et al; 1960; Stevenson and Odom, 1965; Frost, 1968; Levy, Grooch and Keller, 1969, Hill and Sarason, 1966 and Gaudry and Spielberger, 1971).

Much remains to be learnt in this important area of psychological enquiry. It is perhaps plausible that much human striving, much of the endless doing that we call progress, is in one way or another a consequence of anxiety. The urgent need is to acquire the knowledge to utilize anxiety constructively.