CHAPTER II

A REVIEW OF THE RELATED LITERATURE

2.1. Introduction

In the preceding chapter the significance of the problem is discussed. This chapter presents an overview of the relevant studies in a number of countries including Thailand. It is done with a view to gain an insight into the problem under study.

Screening of the students who want to study at the higher levels is necessary in Thailand because of the lack of resources and increasing demand of the people for higher education. Therefore, educators have to make efforts to find out the suitable instruments to use for selecting the candidates with capacity to study at this level. Broom (1960) states in Encyclopedia of Educational Research that "during the first decade or two of the nineteenth century there was a tendency for admission requirement to become more specific and quantitative". (1:263)

In U.S.A. the history of college admission in the seventeenth century is the story of entrance requirements and admission procedures at Harvard College beginning about 1642(1:263). The College Entrance Examination Board (CEEB), established in 1900, has pioneered in the field of measurement

at the point of transition from school to college to construct the achievement test for screening the students to study in the college. Now screening procedure has become popular and is being used by several institutions. (2:8)

Chawal Paeratakul (1964) in his book concludes that the selection tests are used for the purpose of predicting the future performance of the candidates in particular course. The performance on the tests is considered to be a criterion, which indicates an individual's capacity to study. Thus, those people who have obtained higher scores are considered to have higher chances of success in that particular course. (3:24)

It may be noted that, till 1910, it was the testing of achievement which was used as criterion for screening.But, in the decade 1910-1920 the Psychological Testing grew at a fast rate. During this period aptitude tests were developed and psychological tests became one of the important thing in the selection tests. (4:18-19)

Bingham (1942) states that aptitudes indicate potentialities. Aptitude tests measure abilities and interests. They ascertain what an individual actually does in certain standardized situations, and from these measurements we estimate the capacity for further accomplishment which is a statistical probability, and not a certainty. (5:11-17)

Freeman (1971) states that an aptitude is a combination of characteristics indicative of an individual's capacity to acquire (with training) some specific knowledge, skill, or the act of organized responses, such as the ability to speak a language, to become a musician, to do mechanical work. An aptitude test, therefore, is one designed to measure a person's potential ability in an activity of a specialized kind and within a restricted range. (6:431)

Achievement is a resultant of aptitude and interest. The measurement of interests has been done with the inventory technique. One such inventory which is well developed is the Strong Vocational Interest Blank (SVIB), constructed by E. K. Strong Jr. Unlike other early tests, the SVIB has undergone continueing research, revision, and extension. (7: 465-468)

Today, the interest inventories which are commonly used in United States, they are Kuder Preference Record (Vocational), Kuder Preference Record (Occupational), Kuder Preference Record (Personal), Occupational Interest Inventories, a Scale for Measuring the Dominant Interest in Personality, Strong Vocational Interest Blank for Men(Revised), Strong Vocational Interest Blank for Women, etc.(8: 265-272)

During 1930-1945, in U.S.A., a number of personality tests were developed. There are various research reports on

construction of personality tests. Today the personality inventories generally being used, are The Minnesota Multiphasic Personality Inventory, The Mooney Problem Check List, SRA Youth Inventory, SRA Junior Inventory, California Psychological Inventory, Edwards Personal Preference Schedule, Minnesota Counselling Inventory, etc. (8: 280-303)

From the above discussion, it is evident that entrance examination for selecting candidates has got a permanent place. But, in order to get better insight into the functions of entrance examination, it would be better if one looks into other functions also which are served by the examination system. It is due to this reason that all these functions are inter-related so far as measurement is concerned. Therefore, entrance examination should be seen in relation with the total examination system. It is discussed in the subsequent section.

Any system of examination should, generally, perform three major functions, viz., assessment, prediction and trait measurement. The assessment function of examination is the measurement of achievement or attainment of students' performance. This function would explain the extent to which an individual has been benefited from the education that he has received. These measures of candidates' performance would also provide information to parents and teachers from time to time

to know as to how the student is progressing. The evaluation of his progress would also help him in selection or promotion to next class. This function of examinations being diagnostic in nature is always receiving explicit recognition. The second, that is, prediction function, is mainly concerned with prediction of students' performance in subsequent performance and in future tasks which they may be required to perform in the society. This could be done by identifying the special aptitude and achievement abilities of individuals, which could be of value for chosing an appropriate course of study or his fitness in a particular profession. Proper identification of these abilities, referred above would not only help the individual to develop in future but also in a long run, the teachers, counsellors and employers would also be benefited. The last function of examinations, viz., trait measurement concerns identifying the abilities or psychological traits. This would help to know that the abilities developed in students through learning experiences are being measured by the examinations, which could subsequently help in modification of learning experience and or improvement in the procedures and tools of assessment and in finally achieving the objectives of education.

However, the present study deals mainly with the prediction function of the examination as it aims at studying the entrance examination. In order to have deeper understanding into the prediction function of the examination, it would be

worth-while to review the research studies related to this function. They are reviewed in the following section. For convenience and better understanding they are categorised into three parts:

i. studies on prediction function conducted in India,
ii. studies related to prediction function conducted in Thailand, and
iii. studies related to prediction conducted in other countries.

2.2. Studies Related to Prediction Function Conducted in India

Studies on the entrance examinations are generally confined to the predictive validity of marks for achievement in some other subsequent performance of examination on the course they study. Examination is said to be valid "if it measures well what it is supposed to measure". Wiseman (1961) defined validity as "the extent to which a test does what it is designed to do". (9)

Lele and Bhagatwala (1954) developed and used the University Entrance Test for admitting students to the Faculty of Arts and Faculty of Science. The test had a maximum predictive validity coefficient of 0.74 for Arts students and 0.45 for the Science students. (10: 391-392)

Gayen et al. (1961) used the aggregate score in Mathematics as the criterion for estimating the validity of the separate question items and they computed the biserial correlation coefficients for all the 31 items in the question-paper. The values obtained were between 0.31 for question number 7 on graph drawing and 0.73 for question number 9 (c) on the proof of a geometrical theorem. Further, they took the scores of an internal test and the School Final examination of a small representative sample of 81 candidates, and by calculating the Product-moment correlation between the two sets of scores, a measure of validity for the full paper was found to be 0.57. This low index of validity was interpreted by them as a symbol of defect in the question-paper as a measuring device for the true mathematical ability.(11)

Kamat and Deshmukh(1961) inter-correlated the total marks of a group of students for different examinations. The results are presented in Table 2.2.1 below. (12)

Table 2.2.1 : Inter-correlations of Total Marks Between Different Examinations(University of Poona)

Examination	Inter Arts	Inter Science	B.A.	B.Sc.
S.S.C.	0.60 (N=296)	0.61 (N=1143)	0.49 (N=191)	0.21 (N=370)
Inter Arts			0.63 (N=182)	
Inter Science				0.42 (N=347)

These correlations seem to suggest a moderate validity of examination marks.

Lele et al.(1961a) studied the relationships between class records and external assessment of 12 examinations of the M.S.University of Baroda with sample size varying from 20 to 449. They found that the relationships between marks obtained through two procedures were significant in 56(78.87 percent) subjects out of 71. (13)

Taylor (1962d) correlated the marks of 120 college students in Chemistry, Physics, Chemistry practical and Physics practical. He concluded that if the marks are valid measures of ability, there is no apparent connection between practical and theoretical abilities in Physics, none between the two practical abilities in Physics and Chemistry. He remarked that such a conclusion is surely unacceptable and the only alternative is that the marks are not valid measure at all.(14)

Buch (1963) found that S.S.C.E. composite scores of Physics, Chemistry and Mathematics were better predictors for predicting success in the next higher examination.(15)

Raina(1963) found very low correlation coefficient (average 0.14)between internal and external marks of 100 M.Ed.

students who studied from the year 1959 to 1963, of two colleges of Rajasthan University.(16)

Lele et al.(1963b) studied the effectiveness of student achievement at the Secondary School Certificate Examination(S.S.C.E. conducted by the S.S.C.E. Board,Bombay State) in predicting the level of student achievement at the Preparatory Science Examination(P.Sc.E.) conducted by the M.S.University of Baroda. A sample of three successive batches of students, who appeared at the two successive examinations. Four subjects common at S.S.C.E. and P.Sc.E., viz., English, Gujarati plus Hindi, Science and Mathematics were selected for detailed investigation. Elimination of students from the total number was done on the basis of criterion fixed for selection of examination, years and subjects. The number of students who remained after elimination was 325, 295 and 325 for year 1957, 1958 and 1959 respectively. The five independent variables investigated were the marks obtained by the students at S.S.C.E. conducted by S.S.C.E. Board, Bombay State, Poona, in March 1957, March 1958 and March 1959 and the subjects being English, Gujarati plus Hindi, Science, Higher Mathematics and Elementary Mathematics. The five dependent variables studied were the marks obtained by the students at the P.Sc.E. of the M.S.University of Baroda, held during March 1958, March 1959 and March 1960, in English, Gujarati plus Hindi, Science, Mathematics and grand total percent. Results of the

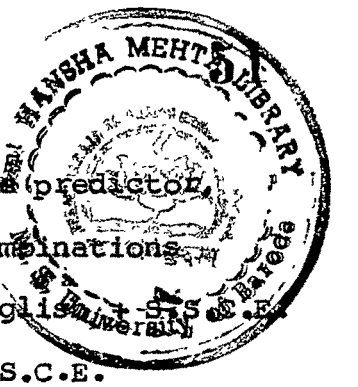
average perfomance of students in the subjects at the S.S.C.E. and the P.Sc.E. for three years, viz., 1957-58, 1958-59, and 1959-60 were compared. The intercorrelations among subjects for the S.S.C.E. and the P.Sc.E. for three years, the results of the separate predictions in the subjects with a view to study the relative effectiveness and the comparative predictions in relation to each of the four criteria, and results regarding prediction of overall P.Sc.E. criterion from single and multiple S.S.C.E. predictors were studied.

The main findings of the investigation were:

i. the forecasting efficiencies of individual predictors in predicting individual criterion went on decreasing year after year in most of the cases in Higher Mathematics,

ii. in general, the best individual predictor of the individual criterion was the score in the same S.S.C.E. subject,

iii. in general, the forecasting efficiencies of the three predictor combinations in predicting the P.Sc.E. for overall criterion went on decreasing year after year in the Higher and Elementary Mathematics for total groups and Higher Mathematics for pass groups,



iv. for admission purposes, the best single predictor, two predictor, and three predictor, combinations were S.S.C.E. Mathematics, S.S.C.E. English + S.S.C.E. Mathematics, and S.S.C.E. English + S.S.C.E. Gujarati plus Hindi + S.S.C.E. Mathematics respectively. He also found the correlation between S.S.C.E. (English) and P.Sc.E.(English) marks to be 0.77(17)

Kamat(1963) found significant correlation coefficients between internal and external marks of 400 Pre-degree Arts and 400 Pre-degree Science students of the University Poona separately. (18)

Palsane(1965) studied the predictive potentiality of the Secondary School Certificate(S.S.C.) Examination scores of the students of Sardar Patel University. The sample of the study involved two batches of students. The first batch consisted of students who had appeared at the S.S.C. Examination in 1957 and had entered the university same year in any of the Faculties of Agriculture, Arts, Commerce, and Science. The second batch consisted of the students who appeared at the degree examinations in 1963 in the Faculties of Agriculture, Arts, Commerce, Science and Engineering. The data related to age, sex, caste, rural-urban origin, father's occupation, number of subjects offered and the marks obtained at the S.S.C.Examination were collected. Those students who passed

and appeared in the examination in the subsequent years were followed up. The students of the second batch were traced backward upto their Pre-University examination in their corresponding faculties.

The study revealed the following :

i. the predictive value of the grand total marks at the S.S.C.Examination was found to be quite high;

ii. Languages-group marks had highest predictive potentiality in the Faculties of Arts and Engineering;

iii. in the Faculty of Commerce, marks in Social Studies at the S.S.C.Examination appeared to be a good predictor variable;

iv. in the Faculties of Engineering and Science, marks in Mathematics at the S.S.C.Examination were found to be a significant predictor variable,

v. marks in Science subjects at the S.S.C. Examination had high predictive value in the Faculty of Engineering, but poor in the Faculty of Science; and

vi. in the Faculty of Arts, performance in the social Studies at the S.S.C.Examination a moderate predictor. (19)

Taylor et al (1966c) found the correlation between Matriculation and Pre-university aggregate marks for a sample of 347 candidates to be 0.72. (20)

Deva (1966) studied the prediction of student teaching success of 546 student-teachers of six teacher training institutions in western Uttar Pradesh preparing for the B.T. examination of Agra University. Intelligence, social adjustment, personality adjustment, socio-economic status and academic achievement were used as predictors of teaching ability.Tools used in this investigation included the Jalota Group Test of General Mental Ability, the Washburne Social Adjustment Inventory, the Saxena's Vyaktiva Parakh Prashnavali, the Kuppuswamy's Socio-Economic Status Scale and a weighted aggregate of divisions obtained at the high school, intermediate and first degree examinations. A rating scale - the Student Teacher Rating Scale was constructed to provide the criterion measure of student teaching. The dimensions of this scale were evolved through Flanegan's "Critical Incidents Technique". By this technique, teacher characteristics were abstracted from actual teaching situations. About 2,300 reported Critical Incidents were scrutinised, classified and categorised to evolve the dimensions. The reliability and validity of the rating scale were established. Correlations between the predictors and the criterion scores and the intercorrelations between the various predictor scores were

computed. The technique of multiple regression analysis was used.

All the correlations between predictor and criterion scores were found significant at 0.01 level. The inter-correlations between different predictor variables, except those between the two personality measures, were not significant. A Multiple correlation coefficient of 0.56, between the predictors and the criterion of teaching success was obtained. The coefficient of Multiple determination worked out to 0.319 showed that just about 32 percent of the variance in the criterion was accounted for by whatever was measured by the five predictor variables taken together. Personality adjustment accounted for 23.6 percent of the variance. Personality thus, seemed to be the most important and intelligence the least important in predicting success in student teaching. The Multiple R dropped by only 0.006 when the Jalota's General Mental Ability Test was eliminated, but fell by 0.95 when the Washburne's Social Adjustment Inventory was removed from the battery of predictors. If any one of the other variables was eliminated, the Multiple R diminisned by about 0.02. The Beta coefficients for the different predictors were found to be .0855 (intelligence), .3627 (social adjustment) and .1506 (academic achievement). The Beta coefficient for intelligence was not found to be significant. (21)

Mathur(1971) studied the predictive validity of some psychological factors, viz., intelligence, aptitude, ability, interests and personality for success in science courses with a sample of 352 boys and 269 girls drawn from four urban and four rural schools. They were divided into three groups according to the subject groups - Science - Mathematics (group I), Science - Biology (Group II) and Humanities (group III). The Jalota's General Mental Ability Test and Nafde's Non-Verbal Test of Intelligence were used along with Numerical Ability Test of; DAT, the Mechanical Comprehension Test and the Space Relation Test from Sharma's Mechanical Aptitude Test Battery, Chatterji's Non-Language Preference Record and Saxena's Personality Inventory as tools of research. All the scores converted into T scores and normalized standard scores. Correlation coefficients between psychological tests and secondary examination marks as a whole and Science subjects were worked out separately.

It was found that

i. the Jalota's test measuring general mental ability was a good predictor of achievement in all these groups with highest correlation coefficient of 0.80 with achievement in general science in group I and lowest of 0.50 with achievement in physics in group II;

ii. the Nafde's Test was to predict achievement in subjects in group I;

iii. the Numerical Ability Test of DAT was to predict achievement in three subjects except biology in group II with correlation coefficients varying in the range of 0.60 to 0.74 and

iv. the other tests, viz., Mechanical Comprehension, Space Relation, Interest Inventory and Personality Inventory were valid predictors for some of the subjects in the three groups. (22)

Nath (1973) correlated the aggregate marks of previous and final of M.A. examinations of Gauhati University consisting of 100 marks for four papers each. He obtained the following values given in Table 2.2.2.(23)

Table 2.2.2 : Inter-Correlations Between M.A. Previous and Final Examinations (Gauhati University)

Subjects	Sample Size	Correlation Co-efficient
English	39	0.76
Economics	72	0.82
Political Science	91	0.83

Singh (1975) developed a test battery consisting of manual dexterity, cause-effect relationship, spatial perception, reasoning, observation, numerical ability and memory for predicting success in achievement in science at intermediate level. The Multiple R was 0.49. (24)

Singh(1978) studied the examination results of preparatory science of the M.S.University of Baroda for the year 1974-75 with a sample of 1054 students by considering the marks in tutorial examination as predictor variables and marks in theory and practical examinations as criterion variables. In the end, the subject-wise total marks in P.Sc. were predicted from marks of S.S.C.Examination. The results were as follows:

i. The marks in tutorial examination got a high predictive value for predicting the marks in theory examination. The following table shows the meaningful predictors in respect of each criterion variable. The placement of the predictor variables is in their rank order of prediction.

Table 2.2.3 : Showing the Meaningful Predictors of Tutorial in Respect of Each Criterion Variable(M.S.U. of Baroda)

Criterion Variables(Theory)	Predictor Variables(Tutorial)
i. English Language and Literature	English Language and Literature, Biology,Mathematics & Physics.
ii. Physics	Mathematics,Biology, Physics, Chemistry, and English Language and Literature.
iii.Chemistry	Chemistry, Biology, Mathematics and English Language and Literature.
iv. Biology (Paper I)	Biology, Chemistry, English Language and Literature,Physics and Mathematics.
v. Biology (Paper II)	Biology, Chemistry, Physics, English Language and Literature and Mathematics.
vi. Mathematics(Paper I)	Mathematics, Chemistry and Physics.
vii.Mathematics(Paper II)	Mathematics, Chemistry,Physics and Biology.

ii. The marks in S.S.C.Examination had got high predictive value for predicting the performance in P.Sc. examination. The following table shows the meaningful predictors in respect of each criterion variable. The placement of the predictor variables is in their rank order of prediction.

Table 2.3.4 : Showing the Meaningful Predictors of S.S.C. Examination in Respect of Each Variable of P.Sc. Examination as Criterion Variable (M.S.U. of Baroda)

Criterion Variables(P.Sc.)	Predictor Variables (S.S.C.E)
i. English Language and Literature	Mathematics and English Language
ii. Physics	Mathematics, Physics and Chemistry, and English Language.
iii.Chemistry	Mathematics,Physics and Chemistry, and English Language.
iv. Biology	Physics and Chemistry,Mathematics and English Language.
v. Mathematics	Mathematics,Physica and Chemistry, and English Language.
vi. Aggregate	Mathematics, Physics and Chemistry, and English Language.

iii. The S.S.C. aggregate percent marks was the single best predictor for predicting the success in P.Sc. examination.

iv. For the purpose of admission in P.Sc. the S.S.C. marks in the following rank order of subjects could be considered in addition to the aggregate:

a) Mathematics;

b) Physics and Chemistry; and

c) English Language.

These three subjects were found to be the meaningful predictors.(25)

2.3. Studies Related to Prediction Function Conducted in Thailand

Poj Sapiachai(1964) studied the predictive effeciency of the entrance examination at the college of Education. The entrance predictors were the scores of Thai, English, Social Studies, Mathematics, Science and the total scores. The criteria were the achievement in subject group of Thai, English, Social Studies, Science, Mathematics, Education and the total achievement in the first year. He found the correlation between the predictors and each of the criterion were low. The Multiple correlation coefficient was 0.63 and the correlation of the total scores with the criterion measures ranging from 0.45 to 0.58. (26: 3210)

Leurn Saiyot (1968) investigated to find out the predictors of the achievement of major mathematics students of Higher Certificate in Education level. The predictors were the scores of the aptitude test composed of subtests, namely; Thai Comprehension, Space Relation, Mathematics and the grade point average of certificate in Education. The results were the Multiple R between the scores of the predictors and the achievement of criterion ranged from 0.27 to 0.65. The highest correlation between the predictors and the criterion was the grade point average of Certificate in Education and the lowest was the Space Relation.(27)

Selecting Research Project, College of Education (1968) reported about the construction of aptitude test for selecting the teacher training student of Certificate in Education level which consisting of five subtests and were tried out with the sample of grade 10 of 11 provinces. The criterion was the achievement of grade 10. It was found that the best predictors were the verbal and numerical subtests and enabled to be used for selecting the students as efficiently as five subtests. So, we need not use five subtests.(28)

Yachai Sooksumalee(1968) attempted to compare the efficiency of the aptitude test, achievement test and scores from grade 12 to predict the achievement of sophomore of

college of Education Bangsan and Patoomvan of 117 students. The results were the achievement test could predict equally well as scores from grade 12 and the aptitude test was lower to predict than others.(29)

Sangob Laksana(1969) studied the predictive validity of entrance test in the year 1965 to predict the achievement of Certificate in Education students which composed of 2 subtests:

i. The aptitude test consisting of subtests placing groups, analogy and logical conditions.

ii. The achievement test composed of subtests Maths, Thai, English, and Science. Results indicated that aptitude test was better for predicting the achievement than the four subtests of achievement test.(30)

Laksana Yootyakorn(1970) studied the predictive validity the Machenical Aptitude Test to predict the achievement of first semester of 304 Higher Vocational Certificate students and found the Multiple correlation coefficient between (i) the predictors and foundation subject, (ii) predictors and vocational subject and (iii) predictors and grade point average, were 0.70, 0.79 and 0.74 respectively. (31)

Junya Meevagana (1971) analysed the Suan Sunandha Teachers College entrance test, namely, Mathematics, Science, Thai, English and General Knowledge; each of them consisted of 50 items. These tests were constructed by the college committee. The technique of 27% was applied to item analysis in order to calculate the power of discrimination and the degree of difficulty. The reliability coefficient and the predictive validity coefficient of the tests were also calculated. The result of the predictive validity of the tests mentioned above with the GPA were 0.59, 0.55, 0.44, 0.66 and 0.18 respectively and of the combination of five tests was 0.55. The predictive validity coefficient of the General Knowledge test was not significant at the 0.05 level but the others and the combination of five tests were significant at the same level. (32)

Nipha Methavechai (1971) investigated the relationship between the Scholastic Aptitude Test and Major Subject Entrance Test results and the achievement of the students at College of Education Bangsan. This study also attempted to make a decision as to which were the best means of prediction on Major Subject achievement, Scholastic Aptitude Scores, Major Subject Entrance Test scores, or both. The subjects were 552 students, in their first year of college. Pearson's correlation and a Multiple correlation techniques were used in analysing the data collected. Thus, the study came up with the following findings:

In the academic year of 1969, the Major subject Entrance Test predicted the students' major achievement on Thai, English and Geography. The Major Subject Entrance Test and the Picture Completion Subtest of the Aptitude Test predicted the students' major achievement on English and Geography. The Major Subject Entrance Test and the Verbal Reasoning Subtest of the Aptitude Test predicted the students' major achievement on Thai. The Aptitude Test, the Picture Completion Subtest predicted the students' major achievement on Biology. The Aptitude Test, the Verbal Reasoning Subtest and the Language Subtest predicted the students' major achievement on History.

All of these findings were significant at or beyond the 0.05 level.

And in 1970, the Major Subject Entrance Test predicted the students' major achievement on Thai, History, Social Studies, English and Geography. The major subject Entrance Test and the Series Subtest of the Aptitude Test predicted the students' major achievement on History and Geography. The Major Subject Entrance Test and the Mathematics Aptitude Test predicted the students' major achievement on Social Studies and English. Only the Social Studies, the English and the Geography major subject attained significance at the 0.01 level. The others were significant at the 0.05 level. (33)

Sutha Sumpavapol(1972) studied the General Aptitude Test which was adopted from D.A.T. composed of subtests : Verbal Reasoning, Abstract Reasoning, Numerical Ability, Space Relation, Machanical Reasoning and Clerical Speed and Accuracy to predict the achievement of freshman of Technical College and Institution of Technology. It was found that when combined 5 subtests except Clerical Speed and Accuracy, the Multiple R with foundation subject was 0.98. The Multiple correlation coefficient, when combined with 6 subtests and vocational subject was found to be 0.57 (34)

Sirikorn Poopaibul(1973) studied the Spatial Relation and Abstract Reasoning of aptitude test to predict the achievement of Geometry of grade 8,9 and 10. The sample was 600 students and the criterion was the scores of Geometry in the second semester in the year 1972. It was found that there were significant relationship between the predictors and the criterion and correlation coefficients were 0.54 and 0.49 respectively. When both predictors were combined the efficiency in prediction was increased. (35)

Vibool Boonsuvan (1974) studied the scores of aptitude test and the achievement from Certificate in Education to predict the achievement of Higher Certificate in Education students in five major subjects, namely; Thai, English, Social Studies, Mathematics and Science. It was

found that Multiple R of the predictors with the criteria were 0.75, 0.39, 0.77, 0.78 and 0.63 respectively. (36)

Yanyong Yanyongmath (1975) analysed the entrance test for selecting the students of Nakornsavan Teachers College in the year 1975. The entrance test consisted of General Knowledge, Mathematics, Thai, English, Science and Social Studies. It was found that the Multiple correlation coefficient of the six subtests with the criterion was .7084 significant at 0.05 level of significance. The Multiple R of five subtests without Social Studies was .7062. There was no significance of difference between the six subtests and five subtests at 0.05 level. The Multiple regression equation in term of standard score was

$$Z_Y = .0772Z_1 + .2877Z_2 + .2885Z_3 + .3002Z_4 + .1515Z_5 . \quad (37)$$

Pitaya Tongwatana (1977) analysed the prediction of English Language Test of Chulalengkorn English Centre to predict the achievement of the first semester of Chulalangkorn University freshman. The sample was 3,014 students of ten departments in the year 1977. The test composed of 2 forms : Form A and Form B. It was found that the Multiple correlation coefficient of Form A test with the criterion ranging from .3902 to .7983 and Form B with the criterion ranged from .4799 to .7862. The best predictor

with the various subjects was grammar test with Beta weights ranged from .1694 to .5263. (38)

Kovit Chaemklang (1979) studied the predictors of Higher Certificate in Education students' achievement in North - East teachers colleges with the sample of 854 students in the year 1979. The achievements used as the criteria were

i. The grade point average of three group courses: Foundation Courses, Professional Courses and Major Courses,

ii. The total Grade Point Average of the combination of the three group courses. The five predictors were
   a) scores from the Major Entrance Test,
   b) the General Ability Test,
   c) the Teachers' Personality Test,
   d) the Occupational Interests Test and
   e) the Achievement from grade 12.

Tha major findings were :

i. For the Achievement in Foundation Courses, the best combined predictors were the Achievement from grade 12, the Major Entrance Test, the Teachers' Personality Test, the General Ability Test and the Occupational Interests Test. The Multiple correlation

coefficient was .4500. The prediction equation in standard score form was:

$$Z_{c1} = .2943Z_5 + .1936Z_1 + .1513Z_3 + .1405Z_2 + .0908Z_4$$

ii. For the Professional Courses, the best combined predictors were the achievement from grade 12, the teachers' Personality Test, the Major Entrance Test and the General Ability Test. The Multiple correlation coefficient was .4078. The prediction equation in standard score form was :

$$Z_{c2} = .2679Z_5 + .2053Z_3 + .2552Z_1 + .1360Z_2$$

iii. For the Major courses the best combined predictors were the Achievement from Grade 12, the Teachers' Personality Test, and the Major Entrance Test. The Multiple correlation coefficient was .4038. The prediction equation in standard score form was:

$$Z_{c_3} = .3255Z_1 + .1411Z_5 + .8874Z_3$$

iv. For the total grade point average, the best combined predictors were the Achivement from Grade 12, the Teachers' Personality Test, the Major Entrance Test, the General Ability Test and the Occupational Interests Test. The Multiple correlation coefficient was .5456. The prediction

equation in standard score form was :

$$Z_{c_4} = .3396Z_5 + .2548Z_1 + .2105Z_3 + .0760Z_4$$

Every Multiple correlation coefficient was significant at 0.01 level. (39)

Chintana Vechmee (1980) studied the relationship between the entrance test results and the achievement of the Ayuthaya Teachers College students in the year 1980 with the sample of 580 first year students.

The study came up with the following findings:

i. The entrance test score of the major subjects (English, History, Home Economics, Mathematics, and Art in the B.Ed. first year students, the Higher Education Certificate first year students major in Dramatic, Art, Agricultural Sciences, the B.Ed. third year students majoring in Home Economics) were significantly related with the achievement at 0.05 level.

ii. The entrance test score of the academic based subjects (History, Home Economics, and Art in the B.Ed. first year students, the Higher Education Certificate first year students majoring in Hygiene Study, Music, and Agricultural Sciences, the B.Ed.

third year students majoring in English) were significantly related with the achievement at 0.05 level.

iii. The entrance test score of the Teacher's Personality-based subject (Art in B.Ed. first year students, Physical Education, Dramatic, Art, and Agricultural Sciences in the Higher Education first year students) were significantly related with the achievement at 0.05 level.

iv. The scores of major subjects, viz., English, History, Mathematics, Science, Music, Dramatic, Art and Home Economics of the entrance test could predict the achievement in the B.Ed. third level. (40)

Department of Teacher Training, Research and Evaluation Unit(1980) found the correlation coefficients of Teachers' Personality Test and Occupational Interests Test with each of Total of Education Courses and Grade Point Average were low, it indicates that Teachers' Personality Test and Occupational Interests are not related with the academic achievement. (41)

2.4. Studies Related to Prediction Function Conducted in Other Countries

Emmett (1952, 1954) studied the predictive validity of marks of 11 + examinations. He obtained the validity

coefficient of about 0.85 after correcting for selection, the criterion being teachers' assessments and O- level marks. (42: 52-62, 43: 91-98)

Chappell et al. (1954) studied the effectiveness of four achievement tests for selecting the students and to predict their achievement at the university of Missuouri and found the Multiple correlation coefficient to be 0.51.(44: 724-725)

In the same year Anderson and Stegman studied the predictive validity of a battery of 7 subtests with freshman achievement at Fort Hays Kansas State College. It was found that the Multiple correlation coefficient with criterion of grade point average (GPA) was 0.667 and also found the best predictors were the Barret Ryan English Test and Schrammel Gray High School and College Reading Test respectively.(45 : 722-729)

Anderson(1956) used the entrance test to predict the freshman college achievement of Northern Illinois University with the criterion of grade point average (GPA) of the first semester and found the Multiple correlation coefficient to be 0.718. (46)

Franz et al. (1958) studied the prediction of grade from pre-admission indicies in Gorgia Tax - Supported College by using the scores from entrance test to predict the grade point average of first semester of freshman of 16 colleges of Gorgia State in the year 1957. They used an aptitude test which consisted of verbal and numerical subtests and the GPA in high school were the predictors. It was found that the Multiple correlation coefficient was at a high level and the best predictor was the GPA in high school. (47: 841-842)

Damico et al. (1959) studied the Multiple Aptitude Test (MAT) composed of nine individual tests to predict the achievement in terms of grade point average obtained by 450 students in Junior College Subjects. They found the Multiple correlations of all tests with the criterion measures to range from 0.38 to 0.83 (48: 611-616)

Bloom (1961) collected the use of academic predictors -grade to predict the achievement of high school and states that "The fact that grades have been shown to be the best single evidence from which to predict college achievement does not alter the fact that the level and precision of predictions from grades have remained relatively low and stable".(49:8-9)

Chawal Paeratakul (1961) investigated the efficiency of the Indiana University Freshman Orientation Test Battery to predict the grade point average at first semester at Indiana University. The students were tested before they had studied about Science, Mathematics, Vocabulary, Essay and the standard test of STEP (Sequential Tests of Education Progress). He found that the Multiple correlation coefficient of the predictors with the criterion to be 0.56. The best predictor was the STEP. (50)

After two years Hughes (1963) found the results which was consentient with the above mentioned that there was significant correlation between the selection test and the achievement of the students. (51: 1448)

Gray (1965) studied the Verbal Reasoning, Abstract Reasoning, Spelling and Sentence Subtests of the Differential Aptitude Tests, Form A. These tests were administered to consecutive classes of young enlisted men at the N.C.O.Academy, Fort Bliss, Texas, in an effort to develop an instrument for screening potential academic success. In addition, the V-R subtest was administered to a third class. The results were analysed relative to the individual's academic achievement in the course. The Verbal Reasoning subtest was found to be a consistent and highly significant instrument for differentiating between the passing and Boarderline - Fail groups as well as

to possess rich potential for screening of individuals prior to acceptance in the course. (52: 352-354)

Guilford et al.(1965) studied the efficiency of intellectual aptitude factors to predict the achievement in nine-grade mathematics at the California State. The three predictor instruments were - the California Test of Mental Maturity (CTMM), the Differential Aptitude Test (DAT) and the Iowa Test of Basic Skills (Iowa). It was found that the DAT composed of 4 subjects could predict the achievement in mathematics better than the CTMM and Iowa. (53: 659-681)

Payne and Tuttle (1966) investigated the predictability of the Miller Analogies Test was used to screen the Master's Degree students relative to the criteria of grades and comprehensive examination scores. They found the greater effectiveness of the M.A.T. in predicting comprehensive examination scores than grade. (54: 427-430)

Bae (1967) studied the prediction of the learning Chemistry among eleventh grade girls through the use of the Stepwise and Doolitle Technique. The subjects for the study were 117 eleventh grade girls in two high schools in California. Fifteen variables comprising a battery of six different tests were used as predictive bases. They were:

1. Iowa Chemistry Aptitude Examination(ICAE): I, Mathematical concept;
2. Iowa Chemistry Aptitude Examination: II, Chemical Formular;
3. Iowa Chemistry Aptitude Examination: III, Reading in Chemistry;
4. Iowa Chemistry Examination: IV, Information in Science;
5. Differential Aptitude Test(DAT) - Verbal Reasoning;
6. DAT - Numerical Ability;
7. DAT - Abstract Reasoning;
8. DAT - Sentence;
9. Test on Understanding Science;
10. Science Background: Things Done;
11. Science Background: Vacabulary;
12. Sequential Tests of Educational Progress:Science;
13. Science Aptitude Examination: Part A, Science Background;
14. Science Aptitude Examination: Part B, Reading in Science; and
15. Science Aptitude Examination: Part C,Scientific and Mathematical Information.

The predictor tests were administered to the subjects at the beginning of their first chemistry course, in September,1963.

The criterion tests consisted of two forms of the American Chemical Society - NSTA Examination in High School Chemistry: Form 1961 and Form 1963. Form 1961 was administered at the end of the first semester in January, 1964, and Form 1963 was administered at the end of the second semester in May, 1964, respectively.

Results:

The results were analysed by both Stepwise and Doolitte methods of multiple regression analyses.

Table 2.4.1 presents the Stepwise analysis for the selection of the most efficient predictor variables for both January and May criteria. Inspection of this table reveals that the most efficient variables for the prediction of the January criterion consisted of four tests. They were: ICAE. Information in Science (var.No.4); DAT: Verbal Reasoning (var. No.5); Numerical Ability (var.No.6); and Science Aptitude Examination: Reading in Science (var. No.14).

In order to determine whether the Multiple correlation based on the above four variables was as efficient as the one based on the initial fifteen variables, the difference between R_{16} .4,5,6,14 = (.7477) and R_{16} .

1,2,3,4,5,6,7,8,9,10,11,12,13,14,15 = (.7873) was tested for significance. The F test showed 1.47 which was not significant at 0.05 level. This outcome suggested a nearly maximum predictive validity of the combination of these four variables.

Table 2.4.1 : Regression Coefficients, Constants, Errors of Estimate, Multiple Correlation Coefficients, Coefficients of Multiple Determination and F-Ratios as Obtained in the Stepwise Analysis (California)

(N=117)

Step	Entering Variable	Regression Coefficient	Constant	Error of R Estimate	R	R^2	F-Ratio
JANUARY CRITERION(var.No.16)							
1	5	.93	-8.81	9.21	.61	.36	68.03
2	4	.66	-8.06	8.54	.68	.46	19.69
	5	.80					
3	4	.58	-14.86	8.05	.73	.53	15.47
	5	.61					
	6	.50					
4	4	.55	-20.70	7.82	.75	.56	7.73
	5	.49					
	6	.47					
	14	.54					
5	4	.50	-22.20	7.76	.75	.57	2.59*

Table 2.4.1 (Contd.....)

Step	Entering Variable	Regression Coefficient	Constant	Error of Estimate	R	R^2	F-Ratio
	5	.39					
	6	.43					
	8	.13					
	14	.51					
MAY CRITERION (var.No.17)							
1	1	1.71	-2.68	8.88	.58	.34	58.98
2	1	1.26	-11.25	8.49	.63	.40	11.87
	5	.42					
3	1	1.00	-10.19	8.22	.67	.44	8.69
	4	.45					
	5	.40					
4	1	.74	-14.11	8.05	.69	.47	5.76
	4	.45					
	5	.33					
	6	.33					
5	1	.77	-13.29	8.01	.69	.48	2.19*
	4	.45					
	5	.34					
	6	.38					
	15	.31					

* Not significant at the .05 level.

The selected variables with a maximum predictive efficiency for the May Criterion consisted of the following four variables:(1) ICAE: Mathematical Concept(Var.no.1): ICAE: Information in Science(var.no.4); DAT: Verbal Reasoning(var.no.5); and DAT: Numerical Ability(var.no.6). The $R_{17}\cdot 1,4,5,6 = (.6865)$ was tested against the $R_{17}\cdot 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15 = (.7208)$ to examine whether the former was significantly lower than the latter. An F ratio of 1.92 was obtained. This result indicated that the combination of these four predictors was probably nearly as efficient as that of the original fifteen predictors.

Table 2.4.2: Beta Weights and Multiple Correlation Coefficients for Certain Combinations of Predictors According to the Doolittle Method(California)

(N=117)

Variable Code	Correlation with Criterion	Beta weights for Certain Combination of Predictors				
JANUARY CRITERION						
1.	.43	-.14				
2	.44	.04				
3	.41	.12				
4	.45	.23	.22	.24	.26	.28
5	.61	.22	.20	.26	.32	.40

Table 2.4.2 (Contd....)

Variable Code	Correlation With Criterion	Beta Weights for Certain Combination of Predictors				
6	.55	.26	.22	.25	.27	.29
7	.59	.06				
8	.37	.10	.13	.14		
9	.18	-.18				
10	.16	-.02				
11	.50	.11				
12	.53	.15	.11			
13	.17	.08				
14	.48	.12	.18	.19	.20	
15	.24	-.11				
R^2		.62	.58	.57	.56	.53
R		.79	.76	.75	.75	.73
F(for successive of R)			1.30	2.03	2.58	7.72*
MAY CRITERION						
1	.58	.21	.21	.23	.25	.34
2	.46	.12	.11			
3	.43	.16	.11	.11		
4	.45	.19	.21	.20	.23	.23
5	.52	.12	.17	.21	.23	.28
6	.51	.19	.18	.19	.21	

Table 2.4.2 (Contd....)

Variable Code	Correlation with Criterion	Beta Weights for Certain Combination of Predictors				
7	.42	.00				
8	.42	.01				
9	.24	-.05				
10	.07	.04				
11	.41	.06				
12	.41	.01				
13	.09	.02				
14	.35	.09				
15	.13	-.17				
R^2		.52	.49	.48	.47	.44
R		.72	.70	.69	.69	.67
F(for successive pairs of R)			.76	1.48	1.90	5.70*

* Significant beyond the .05 level.

Table 2.4.2 presents data obtained from the Dollittle analysis of the January and May Criteria. The data for the collection of fifteen predictors served as the bases for the successive selection of subsets of six, five, four and three predictors. The variables which contributed most to the

variance of the criterion were identified as those producing the highest cross products between their simple correlation coefficients with the criterion and their Beta weights.

For the January Criterion, ICAE: Information in Science: DAT: Verbal Reasoning: DAT: Numerical Ability; and Science Aptitude Examination - Reading in Science were selected as evidencing the simultaneous maximizing of accountable variance and minimizing of number of predictors. These tests were essentially the same tests as those identified by the Stepwise method. When the coefficients and the constant in Table 2.4.1 were used, the regression equation for the prediction of the January becomes

$$Y_1 = .55 X_4 + .49X_5 + .47X_6 + .54X_{14} - 20.70.$$

The most efficient predictors for the May Criterion were ICAE: Mathematical Concept; ICAE: Information in Science: DAT: Verbal Reasoning; and DAT: Numerical Ability. These were the same as those four tests which were selected by the Stepwise method. Using the coefficients and the constant in Table 2.4.1, the Multiple regression equation for predicting the May Criterion scores becomes

$$Y_2 = .74X_1 + .45X_4 + .33X_5 + .33X_6 - 11.11.$$

The findings indicate that the most efficient predictors for achievement in high school chemistry fall into

three categories. The categories are: general intelligence, background experience in science and mathematics, and reading comprehension as measured by selected subtests of the Iowa Chemistry Aptitude Examination, Differential Aptitude Test, and Science Aptitude Examination. (55: 1131-1136)

Passons (1967) studied the ACT (American College Test), SAT (Scholastic Aptitude Test) and High School Grades to Predict first semester GPA and freshman courses of 882 freshmen of Fresno State College who completed in the academic year 1963-64. The nine predictors included the Verbal (V), Mathematical (M), and Total Scores of the College Entrance Examination Board Scholastic Aptitude Test (SAT); the English (E), Mathematics (M), Social Science (SS), Natural Science (NS), and Composite (C) scores of the American College Test (ACT); and the average of high school recommending grades (HSRG), which were A's and B's in academic courses.

The Criteria: The eleven criteria were:

i. First semester GPA,

ii. Biology 2A - Life Science,

iii. English 1A - Reading and Composition,

iv. English 1B - Introduction to literature,

v. History 1 - Western Civilization,

vi. History 10 - American,

vii. Geology 1 - Physical,

viii Mathematics 3 - Calculus,

ix Physical Science 10 - Introduction,

x Psychology 7 - Introduction,

xi. Sociology 1A - Introduction.

The results are shown in the Table 2.4.3.

Table 2.4.3 : Zero-Order Correlation[a] of ACT, SAT, and HSRG with GPA and Grades in Ten Courses (Fresno State College)

Criteria	SAT Scores				ACT Scores				
	HSRG	V	M	T	E	M	SS	NS	C
Sem.GPA(882)[b]	41	39	26	19	33	21	33	28	36
Biol.2A(146)	37	50	48	56	43	36	38	45	51
Engl.1A(463)	38	35	20	29	41	12	25	15	28
Engl.1B(198)	20	30	08	22	28	-06	27	08	16
Hist.1(223)	47	56	27	48	45	22	51	31	48
Hist.10(252)	34	46	18	36	36	19	41	33	41
Geol.1(253)	31	40	40	48	37	25	39	26	42
Math.3(110)	20	34	45	47	34	38	33	35	47
P.Sci.10(103)	41	48	57	58	41	48	37	49	55
Psy.7(676)	34	41	26	18	31	23	40	29	39
Soc.14(182)	21	46	17	37	37	11	41	31	38

a. Decimal points have been omitted.

b. Denotes N used to compute correlation for each criterion.

Findings

HSRG yielded the highest predictive validity for first semester GPA, but the test scores had slightly higher validities for predicting grades in courses. However, in neither comparison were the differences between the highest and the next highest validities of any practical significance.

From Table 2.4.3 the validity of each predictor for each of the criteria may be ascertained. Ranking the nine predictors in terms of validities for each criterion and summing these ranks across all criteria reveals SAT-V as the most productive single predictor for these criteria, followed closely by ACT-C. It does not appear that either the SAT or the ACT clearly surpasses the other in predictive power. (56: 1143-1144)

Elle (1967) studied the prediction of the scholastic aptitude test and the achievement test to predict the grade point average of the first semester of freshmen at Southern Oregon College. He found the scholastic aptitude test was the best predictor. The achievement test that could be well used to predict were the subtests of Social Studies and English. (57: 2875-2876)

Leyman(1967) studied the pre-admission variables composed of the State University Admission Examination total

(SUAE TOT) which consisted of aptitude subtest and achievement subtest separately (SUAE APT, SUAE ACT), high school average (HSA),the Scooter Motor Ability Test (SMA) to predict grade point averages of women physical education major students enrolled at State University College, Cortland, New York. The subjects were the students who initially numbered 203 students enrolled in the falls of 1963, and 1964 and followed the physical education curriculum one year. One hundred and sixty two of the original group completed the second year. It was found that high school grade average and the entrance test measures were significant predictors of first year grade point average (PGPA), the high school grade average was the best single predictor. The Multiple correlation coefficient of five predictors with PGPA was .60. Freshman grade point average, high school average and the entrance test were significant predictors of second year grade point average (SGPA), the best predictor was the PGPA. When combined the six predictors, the Multiple R with SGPA was .71. (58: 1139-1141)

Perberg (1968) studied the predicting academic achievement of engineering and science students in Israel, a longitudinal study (high school through college) was carried out at the Technion-Israel Institute of Technology to investigate academic predictors and problem related to prediction. Four years, three classes of 1,087 engineering

students were followed. Intellective predictors and academic criteria alone were investigated. High School and Matriculation Certificate grades Technion's predictors (Entrance Examination Grades and the Matriculation Certificate combined) were considered.Average yearly grades in Technion with the academic criteria, Technion's entrance examination(Maths-Physics) was the best single predictor. The high school matriculation certificate was a better predictor for later years. Grades in humanities were better predictors in later year for a homogeneous population science. Grade in Physics and Chemistry were better predictors than Mathematics. (59:34)

Ahmad (1968) studied the Otis Quick Scoring Mental Ability Test to predict the academic success in west Pakistan. It was found that the relationship between IQs and academic success is very high and the X^2 is significant at 0.001 level. (60: 947-949)

Burke (1969) studied a group of 178 foreign students enrolled at the University of Southern California (U.S.C.), as well as, for four specific sub-groups of varying levels of evaluated proficiency in English skills. This correlation investigation was undertaken to determine the criterion-related validity of a battery of six achievement and ability examinations that were administered at the start of each semester over a three year period to screen foreign students

for English competency. It was found that GPA could be predicted more accurately than could the measure of Academic standing. The speech Interview, the Larry Ward English Examination for Foreign students, and the California Reading Test were the three most valid scales for the prediction of GPA among the six cognitive tests employed. The intercorrelations among the predictor variables were moderate to high and thus suggested the presence of a substantial degree of overlap among them. The interrelationships among the criterion variables were relative low, and considerably less than those among the predictors. A composite of the predictor variables, as expected, showed a higher degree of validity with each of the criterion measures than did a single predictor. (61: 503-506)

Ayers et al. (1973) studied the MLAT (The Modern Language Aptitude Test), the ACT (The American College Test) and Grade Point Averages to predict the achievement of 224 students enrolled in beginning French, German, or Spanish at Tennessee Technological University. It was found that the Multiple R for the equation was .50 and the standard error of estimate was 1.27. Score from ACT did not contribute to the regression equation. Therefore, it appeared that the best predictor of success was a contribution of scores from the MLAT. (62: 939-942)

Muchinsky and Hoyt (1973) examined the validity of two scales (Achievement and Affiliation) of the Edwards Personal Preference Schedule (EPPS) and of the American Council on Education Psychological Examination (ACE), Quantitative (Q) and Linguistic (L) scores in predicting each of four achievement measures involving grade point averages (GPA's) namely,

i. overall GPA;

ii. senior year GPA;

iii. engineering "Core Courses" GPA; and

iv. the average of two senior year design courses of engineering graduates.

The results were shown according to the Table 2.4.4(63:935-937)

Table 2.4.4 : Correlation of Each of Two Personality and Each of Two Aptitude Variables With Each of Four Indices of College Achievement Involving Grade Point Average

Predictors	Four Criterion Variables			
	Overall GPA	Senior Year GPA	Core Courses GPA	Two Design Courses GPA
ACE Q(N=134)	.34**	.28**	.25**	.17*
ACE L(N=134)	.40**	.31**	.25**	.17**
EPPS Ach.(N=129)	.10	.09	.06	.10
EPPS Aff.(N=129)	-.24**	-.13	-.18*	-.09

* Significant at the .05 level.

** Significant at the .01 level.

Chisson and Lanier (1975) attempted to determine the validity of students SAT (Scholastic Aptitude Test) scores and high school grade point average HSGPA as a predictor of freshman course grades and overall college grade point average (CGPA).

Subjects for the study included 669 freshman students at Georgia Southern College who had enrolled in and completed either English composition 1 or freshman Mathematics during fall quarter, 1973. Data for the study included students' SAT-V scores, SAT-M scores, HSGPA and CGPA. Results showed that a significant Multiple correlation existed between the predictor variables and college grade point average (CGPA). (64: 461-463)

Dalton(1974) studied the predictive of high school rank and SAT scores for minority students. Subjects were 87 males and 114 females admitted as freshmen to Indiana University in the fall of 1972 under a special provision which waives normal entrance requirements. They were admitted by recommendations of high school counsellors, social workers, and school officials throughout the state who were in touch with disadvantaged high school students, especially intercity blacks. The group that was finally selected consisted of 169 blacks, 17 of Maxican or Puerto Rican descent, and 15 whites. Mean total score on the SAT (the scholastic aptitude test)

was 692. Mean HSR (High School Rank) was at the 50th percentile rank. This sample allows one to examine with greater confidence the relative importance of HSR and SAT as predictors of success for culturally different students, since SAT scores and HSR were available for nearly all subjects (although they were not applied as admission criteria). Upon closer examination it appeared that the combination of HSR and SAT scores seemed to be effective for about half the sample. It worked well for "underachiever", i.e., those with total SAT scores above the mean (above 692) and with HSR (below the 50th percentile rank) and for "overachiever", i.e., those who had high HSR and low SAT scores (as indicated in Table 2.4.5).

Table 2.4.5 : Correlations of SAT and HSR with GPA for Four Subgroups of Students (Indiana University)

	Low		High	
	HSR, r	= .21	HSR, r	= .35
	SAT, r	= -.32	SAT, r	= -.07
High	SAT + HSR, R	= .35	SAT+HSR, R	= .36
	N	= 50	N	= 50
HSR		(a)		(b)
	HSR, r	= .29	HSR, r	= .33
	SAT, r	= .02	SAT, r	= .21
	SAT + HSR, R	= .29	SAT+HSR, R	= .62
	N	= 50	N	= 50
		(c)		(d)

In cell (d) for the underachievers, the combination of low HSR and high total SAT scores did correlated more highly with GPA than did either predictor alone (R=.62). In cell(a), for the overachievers, total SAT scores correlated negatively (r = 0-.32) with GPA; yet the combination of total SAT scores with HSR did correlate to a high degree with GPA, although insignificantly, than did HSR alone. In cells (b) and (c) respectively, representing individuals high or low in both predictor variables, improvement in R over the simple r between HSR and GPA was negligible.

It was concluded that the HSR appeared to be a better predictor than was the Scholastic Aptitude Test. The combination of predictors was superior to high school achievement alone as a predictor or both "overachievers" and "underachievers". (65)

2.5 Studies Related to Trait Measurement Function

Chickermane (1943) factor-analysed of arithmetical ability, a battery of tests was constructed with included

i. addition,	ii. subtraction,
iii. multiplication,	iv. division,
v. number series,	vi. error detection,
vii. finding the missing digits,	viii. judgement,
ix. problems,	x. common words,

xi. technical terms, xii. measures,
xiii. Computation, xiv. problems(visual),
xv. table reading, xvi. space diagrams,
xvii. table comprehension, xviii. analogies,
xix. true-false, xx. logical selection, and
xxi. substitution.

These tests were administered to two homogeneous groups of students. The first group consisted of 320 students - teachers from two training colleges at Belgaum and Dharwar. The second group consisted of 210 students of classes VI and VII (Pre-Matric and Matric) from four high schools in Belgaum. Test i to ix were common to both the groups. Tests x to xvii were administered only to the first group. Tests xviii to xxi were administered only to the second group. Correlations were computed using Pearson's product-moment formula. A correlation matrix of 136 coefficients for the first group and of seventy eight for the second group were analysed following the Thurstone's centoid method. After extracting three factors, the residuals seemed to be negligible. The distributions of the residuals were found to approach normal distribution. The centroid factors were then rotated to make them meaningful.

The obtained results showed that the arithmetical ability consisted of

i. Reasoning Factor "G",

ii. the Number Factor "N", which helped in computation, and

iii. the Verbal Factor "V", which helped in problem solving and comprehension. (66)

Gokhale (1954) also factor-analysed the Geometry test of 230 students of class VII from four schools in Poona. Fourteen tests were included in the study. He formed three factors, namely; General Factor, Numerical Factor; and Spatial Factor. (67)

Mehrotra(1954) using the marks in the subjects of both High School and Intermediate Examinations found five factors, out of which there was the factor named as General Scholastic Factor. The other four factors had high loading on languages, Social Studies, Mathematics and Science, Fine Arts and Crafts. (68)

Mitra (1958) factor analysed the marks of Post-graduate examination (in statistics) conducted by the Indian Statistical Institute, Calcutta to find out the common factors underlying the different papers. His study did not provide any conclusive evidences, probably because the sample size(35 students) in his study was very small. (69)

Lele et al. (1964a) conducted a factor analytical study on the two successive examinations, viz., S.S.C.

Examination and P.Sc. Examination of the M.S.University of Baroda. The sample consisted of 503 students in all three batches. The subjects selected from S.S.C.E. were English, Gujarati plus Hindi, General Science, and Higher Mathematics and from P.Sc.E. were English, Gujarati plus Hindi, Science (Physics, Chemistry and Biology), and Mathematics. The analysis was done by the usual centroid method upto four factors.

The study revealed that there were some factors of academic success, and evaluation of these factors should be done as accurately as possible. The overall two factor pattern was consistently found for three years of study but on rotation of axes, these two factors showed two essential components of intelligence or scholastic aptitude "Verbal", and "Numerical Scientific". The data for the first years of study further yielded a clear factor of English which was singled out. The factors thus encountered in this study were: General, Verbal, Numerical, Scientific, and English. Factor loadings related to S.S.C.E. Mathematics, and P.Sc.E.Mathematics were quite consistent throughout the study. (70)

Dash (1967) while factorising his Achievement Test Battery of Oriya, Mathematics, Social Studies and General Science found four centroid factors, viz., General Scholastic Ability, Verbal Application, Mathematical Ability and Memory.(71)

Misra(1968a) found three common factors in the Matriculation Examination of the Gauhati University. The first factor which was dominant was named as 'Verbal'. The second factor and third factor were almost of equal order and were named 'Problem-Solving' factor and 'Memorization' factor. (72)

Gupta (1974) conducted factor analysis of attainments of Higher Secondary/Pre-University passed students in different aspects of physical Sciences and Mathematics. The sample consisted of 200 students belonging to the state of Haryana. These students had passed the higher secondary or pre-university examination. The sample was drawn from colleges situated at district headquarters and also interior places of the districts. A battery of the following nine tests was developed:

i. Physics Test 1(facts and technical terms),

ii. Physics Test 2 (principles and their applications),

iii. Physics Test 3 (numericals),

iv. Chemistry Test 1 (facts, symbols and formulae; and equations),

v. Chemistry Test 2 (chemical laws, properties and their applications),

vi. Chemistry Test 3 (numericals),

viii. Mathematics Test 1(algebra),

ix. Mathematics Test 2(trigonometry), and

x. Mathematics Tests 3 (geometry).

All these tests were having multiple choice items. Data were analysed by employing Product-moment correlations, Thurstone's centriod method of factor analysis, and oblique rotation with the method of extended vectors.

On perusal of the psychologically meaningful factor matrix and the matrix of correlations between the oblique factors, the following factors were discovered:

i. General Mathematical Ability Factor having high loading on all the three mathematics tests;

ii. General Factors of Scientific Ability having high loading on all the tests of physics and chemistry;

iii. Symbol and Numer Factor having high loading on Physics Test 3 (numericals), Chemistry Test 3(numericals) and Mathematics Test 1 (algebra);

iv. Deductive Reasoning Factor having high loadings on Physics Test 2 (principles and their applications) and Chemistry Test 2 (chemical laws, properties and their applications); and

v. Space Factor having significant loadings on Physics Test 3 (numericals) and Mathematics Test 2 (trigonometry). (73)

Tewari (1975) factor-analysed the area of Science and Mathematics. The following achievement tests were constructed and administered to assess the achievement of students in areas of attainments in the Science and Mathematics courses at the high school level,

i. Arithmatic,

ii. Algebra,

iii. Geometry,

iv. Physics theory,

v. Physics practical,

vi. Chemistry theory,

vii. Chemistry practical,

viii. Zoology theory,

ix. Zoology practical,

x. Botany theory, and

xi. Botany practical. Factor analysis was done by Thurstone's centroid method. Medland's method was followed for the estimation of communalities throughout the process of factor analysis. For the better approximation of communalities reiteration was done. Leyard Tucker's criterion and Burt's empirical formula for standard error of factor

loadings together with the Vernon's recommendation were used to test the significance for further extraction of factors. He could extract five factors, namely;

i. Theoretical Factor;

ii. Mathematical Factor;

iii. Biological Science Factor;

iv. Chemistry-Botany Factor, and

v. General Science Factor. (74)

Singh (1978) studied the examination results of Preparatory Science of the M.S.University of Baroda for the year 1974-75 with a sample of 1054 students in order to identify the abilities or common factors being measured the Principal Component factor analytical technique was applied. The obtained factor matrices were further subjected to rotation of axes by the Varinax Rotation method. The analysis of data had been carried out with respect to each of the three procedure of assessment, viz., tutorial, theory and practical separately and by grouping the marks of all these three assessments. Finally, the marks on S.S.C.Examination were grouped with marks of P.Sc. examination to find out the common factors being measured by the two successive examinations.

Variables

Tutorial examination was conducted in all five subjects viz.,

i. English Language & Literature;

ii. Physics,

iii. Chemistry,

iv. Biology, and

v. Mathematics with one paper each.

In theory examination, three subjects (English Language and Literature, Physics, and Chemistry) had examination in one paper each whereas in the remaining two subjects - Biology and Mathematics, these were two papers each. Practical examinations were conducted in the science subjects, viz., Physics, Chemistry and Biology at the end of the year. The marks of S.S.C.Examination were considered for only three subjects, namely:

i. English Language;

ii. Mathematics; and

iii. Physics and Chemistry.

The results were as follows:

i. The fundamental common factors found in tutorial examination were:

a) General-Scholastic;

b) Scientific-Verbal;

c) Scientific-Numerical.

ii. In theory examination, the common factors found were same as those of tutorial examination. In

this examination the factor loadings were comporatively higher than the corresponding loadings on tutorial examination.

iii. In practical examination, only one factor of 'General' ability was found.

iv. In P.Sc.Examination (when the marks in tutorial, theory and practical were grouped) four factors, viz., 'General-Scholastic'; 'Scientific-Numerical'; 'Scientific-Verbal'; and 'Problem-Solving' were found.

v. Five factors found in S.S.C. and P.Sc. level (two being the successive examinations) were :

a) General-Scholastic;

b) Problem-Solving;

c) Memorization;

d) Scientific-Verbal;

e) Scientific-Numerical.(25)

2.6 An Overview

As would be seen from the foregoing review of the related literature, it is seen that the researchers have been working hard to study the quality of the selection test and go on improving its efficiency. The method of study is an analysis of the predictive validity by finding the correlation and

Multiple correlation between the predictors and criterion to see the efficiency of the selection tests for selecting the students and constructing the Multiple regression equation to use for predicting the achievement in academic studies.

Multiple correlation method is usually used such as Fox (1950) used the Multiple correlation method to study in his research and reported that the use of Multiple correlation method enable to estimate the achievement of freshman correctly with the Multiple correlation coefficient to be 0.789 and emphasised that this method will help to promote indication of prediction more higher. (75)

Pickrel (1958) advised that in the case of predicting the criterion from many predictors Multiple correlation method is the best technique to estimate the value and can construct regression equation to predict one's score of learning. (76)

Under trait measurement function of examinations, the results of the studies reported do not show any conclusive evidences which could be considered as final. The finding vary from study to study. In Thailand researchers have not studied about the trait measurement function. The present study would attempt to investigate in detail the abilities or common

factors underlying the entrance examination.

From the review of the related literature, the correlation between the predictors and the criterion ranges from -0.24 to 0.77, Muchinsky and Hoyt (1973), Poj Sapianchai (1961), Sirikorn Poopaibul (1973), Lele and Bhagatwala (1954) and Lele et al. (1963) and the Multiple correlation coefficient ranged from .1694 to .982, Pitaya Tongwatana (1977), Leurn Saiyot (1968), Damico et al. (1959), Ayers et al. (1973), Chappell et al. (1954), Chawal Paeratakul (1961), Anderson (1956), Vibool Boonsuvan (1974), Sutha Sumpavapol (1972). All of these depended on the kinds of selection tests and the criterion.

Another significant point which can be observed from the related literature is that the entrance examinations consist mainly of aptitude test and achievement test, Chappell et al. (1954), Anderson and Stegman (1954), Franz et al. (1958), Damico et al. (1965), Chissom and Lanier (1975), Poj Sapianchai (1961), Yachai Sooksumalee (1968).

But, of late it is emphasised that personality of person, the general ability and interest also would count for his success in the profession. Therefore, recently general ability test, personality test, and interest inventories are also included in the entrance test. But, the question arises

to what extent these tests are valid and are in a position to predict the performance of the candidates in the education courses. The answer to this question can be provided only when some systematic investigation is undertaken to examine the predictive validity of these additional tests.

In addition to the above, one finds that a few studies have been conducted for the purpose of trait measurement in India, Chickenmane (1943), Gokhale (1954), Malhotra (1954), Mitra (1958), Lele et al (1964a), Dash (1967), Misra (1968a), Gupta (1974), Tewari (1975) and Singh (1978). But, the literature provides clue that not even a single study has been undertaken in Thailand for the trait measurement purpose. Therefore, it becomes interesting to know what traits are being measured through the entrance examinations being conducted for admitting students to education courses, in teachers colleges of Thailand.

2.7 Task for the Present Study

From the over view of the related literature it can be observed that certain problems have been tackled by the researchers and solutions arrived at. But, there are certain gaps remaining due to which some important issues arise which provide the guideline for : What is to be done in the present study ? The main task for the present study is to study the

effectiveness of the entrance test consisting of the following tests, viz.,

i. General Ability Test, composed of five subtests, namely;
   a) Thai;
   b) English;
   c) Mathematics;
   d) Science and
   e) Social Studies;

ii. Major Subject Test,

iii. Teachers' Personality Test and

iv. Occupational Interests Test to predict the performance of teacher trainees in the Diploma in Education and to study the factors underlying the entrance examination.

The main task for the present study which is just indicated in the preceding paragraph has been undertaken mainly due to the following reasons:

i. Quality of education to a very great extent depends on the quality of the persons employed in this profession. Therefore, one should try to select the most efficient people for the teacher training courses. For this purpose, entrance tests are held

and trainees are selected. But, does these tests have the ability to select the most efficient people ? This is the most prominant question which should be answered by the researchers.

ii. Another issue which is related to the earlier one is, that, what are the abilities which are being measured through the entrance test ? It is important because until one knows which abilities are being measured through the test one cannot compare them with the abilities required for the profession. Therefore, through systematic investigation researchers should solve this problem. The present investigation attempts to find the solutions to the above raised problems.

The success of the task under taken depends on the way study is conducted. In order to complete this task successfully, a sample of 491 subjects would be selected to judge the suitability of the entrance test for predicting the success of candidates in Diploma in Education course. A sample of 3,000 subjects would be selected to find out the common factors underlying the entrance test. Out of these 3,000 candidates, 1,000 would be selected for each year i.e. 1980, 1981 and 1982. The data would be collected by the investigator personally from the official records available with the

Registrar's Office. The obtained data would be analysed by employing Product-moment correlation and Multiple correlation techniques in order to arrive at valid results. The details, indicating how exactly the investigation is carried out are given in the methodology chapter.

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