DOCUMENT RESUME

ED 268 180 TM 860 247

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TITLE An Instrument for the Assessment of Study Behaviors of College Students.
PUB DATE Apr 86
NOTE 29p.; Paper presented at the Annual Meeting of the American Educational Research Association (70th, San Francisco, CA, April 16-20, 1986).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Attitude Measures; College Students; Educational Development; *Factor Analysis; Factor Structure; Higher Education; Interest Inventories; Psychometrics; Student Behavior; *Study Habits; *Test Construction; *Test Reliability; *Test Validity
IDENTIFIERS *Study Behavior Inventory

ABSTRACT

The psychometric properties of an instrument designed to assess study behaviors of college and university students were examined. A convenience sample of 1052 undergraduates at a group of midwestern colleges and universities and at a four-year college in a United States Caribbean territory responded to the Study Behavior Inventory (SBI), Form D. A series of factor analyses using the principal components model with iteration and varimax rotations yielded three factors composed of items which appear to deal with feelings of competence, preparation for daily routine academic tasks, and preparation for special academic tasks (e.g., term papers and examinations). Internal consistency reliability estimates for the entire instrument and the items in each of the three factors ranged from .70 to .88. The findings indicated that the SBI is a valid and reliable instrument for assessing study behaviors. It is suggested that providers of developmental education and other study skills program should consider including a strong counseling component in their offerings and that it may be useful to view study behaviors as consisting of two sets of activities directed toward short term, routine goals and toward long range, specific goals, respectively. References and tables are appended. (Author/PN)

An Instrument for the Assessment of Study Behaviors of College Students

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Running head: ASSESSMENT OF STUDY BEHAVIORS IN COLLEGE STUDENTS

Presented at the Annual Meeting of the American Educational Research Association, San Fransisco, April 1986

Abstract

The psychometric properties of an instrument designed to assess study behaviors of college and university students was examined. A convenience sample of 1052 undergraduates at a group of midwestern colleges and universities and at a four year college in a U.S. Caribbean territory responded to the Study Behavior Inventory, Form D. A series of factor analyses using the principal components model with iteration and varimax rotations yielded three factors composed of items which seemed to deal with feelings of competence, preparation for day to day, routine academic tasks, and preparation for special academic tasks such as term papers and examinations. Internal consistency reliability estimates for the entire instrument and the items in each of the three factors ranged from .70 to .88

The findings suggest that the SBI is a valid and reliable instrument for assessing study behaviors and that providers of developmental education and other study skills programs should consider including a strong counseling component in their offerings and that it may be useful to view study behaviors as consisting of two sets of activities directed toward short term, routine goals and toward long range, specific goals, respectively.

An Instrument for the Assessment of Study Behaviors of College Students

Social pressures for equality in access to institutions of higher education and a continuing decline in the pool of qualified potential freshmen have resulted in these institutions admitting and continuing to admit students who possess less than adequate preparation to succeed academically. The effects on academic programs of the presence of these students has been well documented (Austin, 1975, 1977; Friedlander, 1980; Lenning, Saur & Beal, 1980; Linquist, 1981) and has been found to be profound in terms of allocation of resources, academic standards within classes and departments, student retention rates, patterns of course offerings, and faculty satisfaction, among other variables.

In light of this, it is not surprising to find that most institutions are offering additional programs for these less than adequately prepared students (Cross, 1981; Barna, Haws, & Knefelkamp, 1982) and that these programs range in effectiveness from the highly successful to the virtually ineffective (Lenning, et al, 1980; Ramist, 1981). In spite of the presence of these programs, however, Friedlander (1980) noted that high risk

students tend to fail to avail themselves of assistance and, as a result, do not generally improve their skills even in situations where excellent programs are available.

There are a number of variables which may contribute to a student's academic success. However, Hunter (1979) suggested that among the most important of these are variables in the affective domain. He suggests that one of these, study habits and skills, will account for more variance in academic achievement than more traditional predictors of academic success in college such as high school grades, class rank, or Scholastic Aptitude Test scores.

Measuring Study Behaviors

The first published attempt to measure and describe study behaviors of college and university students was carried out by Wren (1941) resulting in the Study Habits Inventory which attempted to measure general study attitudes and behaviors, reading and note taking techniques, and strategies for studying for examinations. Mueller and Gibson (1982) used items on the SHI combined with others taken from the Study of Study Habits and Attitudes, Form C (Brown & Holtzman, 1966) to develop the Study Behavior Inventory, Form B and tested it using a sample of Northern Illinois State University students. This lead to the development of Form C which added items related to test anxiety

and coping behavior.

Form C of the SBI was administered to 3,078 students at a community college in the Chicago area (Mueller & Gibson, 1983) and the scores obtained were found to correlate highly with subjects' high school and college grade point averages. In addition, subjects who reported needs for assistance in one or more of ten academic skill areas had lower scores on the SBI-C than subjects who did not report such needs. Finally, older students tended to have higher SBI-C scores than younger students, showing more efficient study behaviors.

As a result of the findings on this administration, Form D of the SBI was developed. Form D is a significant revision of the SBI in that it expands the general study attitudes section of the instrument while decreasing the number of items in the reading and note taking techniques and in the coping with examinations categories in response to the item analysis conducted on the Form C sample. In addition, the three point rating scales of Form C were changed to four point scales.

Construct Validation

Construct validity is established whenever the results of an instrument are to be interpreted as a measure of some quality that is not operationally defined (Cronbach & Meehl, 1955). It

is used when no criterion or universe of content is generally accepted as adequate to define the quality to be measured. This is the case with the Study Behavior Inventory since the universe of study skills has not been defined, nor have criteria for acceptable outcomes of study skills been formally determined.

Guilford (1948) has pointed out, however, that factor analysis can produce groups of intercorrelated measures (e.g. inventory items) which can be identified as the "real dimensions" of the construct. These factors can be described both quantitatively and qualitatively and it may be determined whether or not they are consistent with the theoretical framework hypothesized for the construct.

The purpose of this study was to examine the psychometric properties of the SBI, Form D and to investigate the construct validity of the instrument by determining the factor structure underlying the responses on the instrument.

Method

Sample

A total of 1,052 undergraduate students responded to the SBI-D during the winter of 1983-84. Respondents were enrolled in classes at three community colleges in the Chicago metropolitan area, a small midwestern U.S. four year college, a large Illinois

state university, and a four year college in a U.S. Caribbean territory. This was a convenience sample in that instructors volunteered to administer the instrument to their students during class. Responses were anonymous and no names were asked for on the form which was used.

Instrumentation

Form D of the Study Behavior Inventory is a 46 item instrument composed of a series of statements to which subjects respond on a four point scale indicating how often a particular statement might apply to them. Specifically, the responses could be (1) Rarely or never, (2) Sometimes, (3) Often or usually, or (4) Almost always. Items are stated positively and negatively in order to avoid response set. The instrument is divided into three sections dealing with general study attitudes and behaviors, reading and note taking techniques, and strategies for coping with examinations. In addition, an information section was appended to the survey for research purposes. It requested demographic and academic information including age, sex, academic major, high school and college grade point averages, class status, SAT and/or ACT scores, and a measure of expectation of college success. The time required for a subject to complete the SBI-D ranges from 15 to 20 minutes, not including the appended

information section.

A pilot study carried out by Mueller and Feiza (1984) with a sample of 62 subjects produced a test-retest reliability coefficient of .94 with three weeks between administrations using Form D.

Procedure

The Study Behavior Inventory, Form D was administered to the sample of subjects along with the information survey sheet by college and university professors during regular class times. Subjects were instructed to attempt to answer all items and to work until they had completed the instrument.

Scores were coded so that positive responses (those indicating appropriate study behaviors) were coded high while negative responses were coded low.

An exploratory factor analysis using the principal components model with iteration and a varimax rotation was carried out in order to begin to determine the factors underlying study behavior as measured by the SBI. A second factor analysis, using the same model, was performed controlling the number of factors using information derived from the exploratory analysis and these results were used to define the factor structure of the instrument.

Finally, Cronbach's alpha was calculated for the entire SBI

and for each of the derived factors in order to determine levels of internal consistency (a reliability measure) of the entire instrument and of the derived factors.

Results

Exploratory Factor Analysis

The exploratory factor analysis resulted in 11 factors with eigen values above 1.00 after rotation. Of these, the first four appeared to be significant upon application of scree testing procedures and these four factors accounted for 78% of the variance in the instrument. The inventory items loading highest on each factor are listed in Tables 1 through 4. Table 5 lists items which did not load strongly or uniquely on any of the four factors derived by the analysis.

Place Tables 1 through 5 about here

Factor 1 accounted for 44.9% of the variance of the scores on the SBI and seemed to deal with feelings relating to low security, poor self esteem, and lack of competence.

Factor 2, accounting for 17.2% of the variance, seemed to be composed of items which dealt with the use of available time.

Factor 3, which accounted for 9.3% of the toal variance, appeared to be composed of items which surveyed subjects' study

behaviors in dealing with day to day routine academic tasks such as note taking and preparation for classes.

Items dealing with preparation for specific tasks such as examinations, papers, and reports loaded highest on factor 4 and this factor accounted for 7.0% of the total variance of the scores on the instrument.

Confirmatory Factor Analysis

The confirmatory factor analysis was done by forcing four factors out of the solution. Factor 1 accounted for 58% of the variance of the scores on the inventory and was clearly the same factor obtained in the exploratory analysis dealing with feelings related to low security and lack of competence. Items which loaded heaviest on factor 2 (accounting for 23.1% of the variance) were concerned with the routine, day to day, academic tasks that made up factor 3 of the exploratory analysis.

However, factors 3 and 4 turned out to be somewhat ambiguous. Both factors appeared to contain items loading high on them which dealt with use of time and preparation for specific assigned academic tasks as well as including a number of items which appeared to survey behaviors concerning the completion of the types of routine tasks making up factor 2. It was noted that a number of these variables, particularly those that intuitively

might have been expected to be included in factor 2, while meeting the criteria for inclusion in factors 3 and 4 (i.e. a loading of at least .35 on one of these factors with no loading greater than .25 on any other factor) just barely met these criteria. Since the criteria are somewhat arbitrary, it may be that the shared variance between a number of these items accounted for the low loadings and that requiring a higher minimum loading for the inclusion of a variable in a factor might have produced more interpretable results.

To investigate this possibility, another analysis was done forcing three factors in a principal components solution and doing a varimax rotation. The three factor solution yielded a much more interpretable factor structure as seen in Table 6. The item numbers in this table refer to the items in Tables 1-5.

Place Table 6 about here

Factor 1 was clearly the same factor obtained in the four factor solution. It contained items dealing with feelings of lack of competence, low security, and poor self esteem. This factor accounted for 64.3% of the variance of the scores on the inventory.

Factor 2, accounting for 25.5% of the total variance, was

similar to the second factor in the four factor solution and contained variables which assessed behaviors exhibited by students in preparing for day to day, routine academic activities.

Factor 3 contained variables that dealt with study behaviors involved in planning for and carrying out specific long range academic tasks such as writing papers and studying for examinations. This factor was similar to the fourth factor in the four factor solution and accounted for 10.3% of the total variance of the Study Behavior Inventory scores.

It appeared that the items which loaded highest on the third factor in the four factor solution were dispersed to factors 2 and 3 in the three factor solution. This could have been due to the fact that the items on these initial factors all dealt with the use and organization of time with some pertaining to time use in routine academic tasks and others to specific, long range tasks. Forcing a three factor solution had the effect of forcing these items into this dichotomy.

In addition, there were eight items on the SBI-D which did not appear to load substantially on any of the three factors. These are listed in Table 6.

It is interesting to note that the three items dealing with

examinations and paper writing might have been expected to load highest on factor 3, but none of the loadings on these items even approached the criterion of a .35 loading on any of the factors, nor is there anything in the item intercorrelations to suggest the reason for this phenomenon.

Reliability

Cronbach's alpha reliability estimate for the entire Study Behavior Inventory, Form D was equal to .88. For the responses on the items loading on factors 1, 2, and 3, the reliability estimates were .86, .82, and .70, respectively.

Discussion

The Study Behavior Inventory, Form D appears to be a valid and reliable instrument for assessing academic preparation strategies in college and university students. The three factors derived through the factor analytic procedures are intuitively clear and seem to describe categories of behaviors which would commonly be considered to be groups of study behaviors. Of particular interest is the fact that factor 1, accounting for almost two thirds of the variance on the entire instrument, has to do with subjects' feelings about self (not actually a behavior, at all); particularly with those feelings concerning competency and security in academic settings. While the strong correlation between SBI scores and academic success reported by

Mueller and Gibson (1983) does not necessarily imply a cause and effect relationship between level of study skills and grade point average, it does suggest directions for further research and for programming in developmental education efforts. Should experimental studies establish a causal relationship between study behaviors, particularly those measured by factor 1 of the SBI, and academic success, providers of developmental education might wish to consider a strong counseling component in their programs that would increases students' feelings of competence and self worth. This may be particularly significant in view of the finding by Friedlander (1980) that high risk students (who would tend to have low grade point averages and SBI scores) very often do not participate in programs designed to help them improve their skills. Feelings of incompetence and low self esteem are likely to lead to feelings of helplessness and hopeless; of an inability to be helped.

The derived SBI factor structure also suggests that students perceive academic preparation as consisting of two sets of tasks rather than as a single task of "studying." What seems to distinguish these two sets of behaviors from each other is their level of routineness and the specificity of the goal toward which the preparation is being done. The first set of study behaviors

involves tasks which must be carried on regularly from day to day with no specific goal being obvious. These include doing reading and homework assignments for class sessions, organizing study time on a day to day basis, and reviewing lecture notes. The second set of behaviors involves specific academic activities which may occur at irregular intervals during a course and for which planning must be done over a longer period of time. These include activities such as studying for examinations and preparing reports and term papers.

The above finding suggests that providers of programs which seek to improve study skills of college and university students need to develop strategies to deal with two types of study situations: studying for long and short term academic tasks. Preparation for these two types of tasks may constitute two sets of skills where there may be some behaviors common to both sets and others which are unique to one or the other set.

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Table 1

Inventory Items Loading on Factor 1 in the Exploratory Factor Analysis

Item	Loading
22. I have to re-read material several times; passages do not have much meaning the first time I go over them.	.3521
32. I get nervous and confused when taking an examination and fail to answer questions to the best of my ability.	.7416
33. I do poorly on tests because I find it hard to think clearly and plan my work when I am faced with an exam.	.7003
34. I have difficulty in picking out important points of a reading assignment; points that later appear on examinations.	.5162
35. I lose points on true-false or multiple-choice examinations because I changed my original answer only to discover later that I was right the first time.	.4679

41. When tests are returned, I find that my grade has been lowered because of careless mistakes.	.4871
42. During an examination, I forget names, dates, formulas, and other details that I really do know.	.5988
45. I think I could do much better on tests if I could take them alone and/or not feel pressured by a time limit.	.5511
46. Worrying about how well I will do intereferes with my preparation and performance on tests.	.7482

Table 2

Inventory Items Loading on Factor 2 in the Exploratory Factor Analysis

Item	Loading
2. I find it hard to force myself to finish work by a certain time; work is unfinished, inferior, or not on time.	.7910
14. My teachers criticize my written reports as being hastily written or poorly organized.	.6687
15. I lay aside returned examinations, reports, and homework assignments without bothering to correct errors noted by the instructor.	.3502
19. I watch too much television and this interferes with my studies.	.4007
20. I work too many hours for the course load I am carrying.	.5391
21. Personal problems with my family affect my ability to concentrate on studying.	.4803

24.	I skip over the figures, graphs, and tables in a reading assignment.	.3952
38.	I am careless with spelling and mechanics of English composition when answering examination questions.	.4218

Table 3

Inventory Items Loading on Factor 3 in the Exploratory Factor Analysis

Item	Loading
7. I keep my assignments up-to-date by doing my work regularly from day-to-day.	.4091
10. When I am having difficulty with my schoolwork, I try to talk over the trouble with the teacher.	.4183
17. I try to do some "over-learning"; working beyond the point of immediate memory or recall.	.3813
27. When reading a long textbook assignment, I stop periodically and mentally review the main points that have been presented.	.6025
29. After a class lecture, I go back and recite to myself the material in my notes, rechecking any points I find doubtful.	.6052
31. Before attending class, I prepare by reading or studying the assignment.	.4687

Table 4

Inventory Items Loading on Factor 4 of the Exploratory Factor Analysis

Item	Loading
11. In preparing reports, themes, term papers, etc., I make certain that I clearly understand what is wanted before I begin to work.	.4372
12. When I get behind in my schoolwork for some unavoidable reason, I make up back assignments without prompting from the teacher.	.4327
26. When in doubt about the proper form of a written report, I refer to an approved model to provide a guide to follow.	.3681
30. I keep all the notes for each subject together, carefully arranging them in some logical order.	.3692
36. I plan out in my mind the answer to subjective or essay-type questions before starting to write the answer.	.5455

37. When preparing for an examination, I learn facts in some logical order of importance, order of presentation in class or textbook, order of time in history, etc. .5233

Table 5

Inventory Items Not Loading on Any of the Four Factors in the Exploratory Analysis

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1. My time is unwisely distributed; I spend too much time on some things and not enough on others.
3. With some of my courses, I like to study with others.
4. I complete my homework assignments on time.
5. I try to carry over and relate material learned in one course to that learned in others.
6. I copy the diagrams, drawings, tables, and other illustrations that the instructor puts on the blackboard.
8. I prefer to study alone rather than with others.
9. At the beginning of a study period, I organize my work so that I will utilize the time most effectively.
13. Difficulty in expressing myself in writing slows me down on reports, themes, examinations, and other work to be turned in.
16. My studying is done in a random, unplanned manner; impelled mostly by the demands of approaching classes.
18. I put off writing themes, reports, term papers, etc., until the last minute.

23. I try to summarize, classify, and systematize the facts learned, associating them with previously learned materials and facts.

25. After reading several pages of an assignment, I am unable to recall what I just read.

28. When writing down notes from a lecture, I have trouble picking out the important points: I tend to put down material which turns out to be unimportant.

39. Although I work until the last possible minute, I am unable to finish examination within the allotted time.

40. If time is available, I take a few minutes to check over my answers before turning in my examination paper.

43. I believe that grades are based upon a student's ability to memorize facts rather than upon the ability to "think things through."

44. I study harder for final exams than for the rest of my coursework.

Table 6

Item Loadings on the Three Factor Confirmatory Factor Analysis

Factor 1		Factor 2		Factor 3		No Factor
Item	Loading	Item	Loading	Item	Loading	Item
13	.3848	1	.3723	2	.4253	3
21	.3437	5	.3771	4	.4664	6
22	.4792	7	.5363	12	.4352	8
25	.4486	9	.4844	14	.4770	20
28	.4421	10	.4815	30	.4094	26
32	.7348	11	.3571	36	.3054	40
33	.7173	15	.4060	37	.3280	43
34	.5735	16	.5233	38	.3936	44
35	.4794	17	.5233			
39	.3909	18	.5025			
41	.4929	19	.3261			
42	.6273	23	.4799			
45	.5285	24	.4069			
46	.7229	27	.5045			
		29	.6023			
		31	.5433			