The Content Analysis of ACT ASSET: The Validation of an Instrument to Assess the Cognitive Entry Characteristics of College Students in View of Promoting Persistence and Transfer.

by

Gilles L. Talbot
Champlain Regional College
Saint Lawrence Campus
Ste-Foy, P.Q. G1V 4K2

This report was made possible by a grant from:
Programme d'aide à la recherche sur l'enseignement et l'apprentissage
Direction générale de l'enseignement collégial,
Ministère de l'enseignement supérieur et de la science du Québec

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Chapter 1

Background Information About ACT ASSET

Identification

Title

"ASSET - Assessment of Skills for Successful Entry and Transfer. A Student Advising, Placement and Retention Service."

Publisher

American College Testing (ACT)
ASSET Program
P.O. Box 168
2201 North Dodge Street
Iowa City, Iowa 52243

Forms and Groups to Which Applicable

One form and level for each of: Language Usage Skills, Reading Skills, Numerical Skills and Advanced Language Usage Skills. The Algebra Skills sub-test allows for one of three levels - "Elementary," "Intermediate," or "College" - depending on the amount of preparation in (American) high school mathematics. These directions are given to students to explain what level of the Algebra test to take:

If you have completed:	ASSET Math Unit
1 year or less of high school algebra, you should take.....	Elementary Algebra Skills (Go to page 15)
1 1/2 to 2 years of high school algebra, you should take.....	Intermediate Algebra Skills (Go to page 19)
2 years of high school algebra and geometry, trigonometry or numerical analysis (pre-calculus), you should take.....	College Algebra Skills (Go to page 23)

ACT ASSET reports that "students entering two-year institutions" [1] are the target population. Consulting the list of institutions that generated the norms [2] reveals that this phrase refers to: "Junior," "Community," "Technical," "Institute," "Trade-Technical" or just simply "College" institutions. One of the references is a State Junior College operated by a prison in Alabama.

Under the "Norms and Norming Procedures" (Chapter VI) one finds:

> The most recent norms for the 1985 ASSET examinations were developed from the June-January 1983-1985 administrations of the tests. The tests were administered during pre-semester orientation sessions at over 112 different institutions across the nation. These institutions (see Appendix D) are predominantly public, two-year schools that range in size from under 1,000 to over 25,000 students. Located in both urban and rural communities, these institutions offer a variety of educational and career-oriented programs. Test records and demographic data were collected for 164,830 students and a systematic (10%) sample of these students was selected for analysis. (ASSET Technical Manual, 1986, p.27.)

Characteristics about age range are described as:

> Fifteen percent of the sampled ASSET examinees were under the age of 20, 59 percent were between the ages of 20 and 29, and 24 percent were 30 years of age or

---

1. ASSET Technical Manual, 1986 p.1

2. Ibid., p53.

older (ASSET Technical Manual, page 39).

A breakdown by age groups would appear possible given the size of the population studied. These tables would help institutions to differentiate amongst its regular and adolescent group, continuing education, or adult populations. This seems important given the increasing evidence that the processes of, and needs for, learning differ for adolescents and adults.

Under "Ethnic Background", within the same chapter, one reads:

> The ethnic background of the sampled ASSET examinees was 19 percent Black/Afro-American, 54 percent White/Caucasian, five percent Asian/Pacific Islander, one percent American Indian/Alaskan Native, and one percent Filipino. Six percent failed to mark their answer sheet or selected the "other" option (ibid., p40).

Additional information is available about the incidence of English as a primary language and the educational aspirations of examinees. Information about the ethnic background seems appropriate in the American context given the federal laws that regulate discrimination. It seems logical to report norms which establish that the population sampled represents the various ethnic backgrounds. Perhaps the most promising aspect would have been a preliminary statistical report on the characteristics of the 13% of students who did not report English as their primary language. While such information is available for test performance in relation to ethnicity (Table 6.14) it is presented only for examinees who speak English as a primary language. What happens to examinees in the 13% non-English language group? Are they automatically placed in remedial or developmental education programs?

The chapter closes with suggestions for an institution to prepare its own local norms so as to test the adequacy of the test battery with their specific needs. ACT ASSET innovates by encouraging and explaining the means for potential users to examine the purposes of the test with institutional needs. However, the organization of the material, from a user point of view, may be enhanced by regrouping the explanation of the procedure (found on page 24) the 'encouragement' (found on page 40 in the Technical Manual) with pages 1 thru 10 in the "Action Guide."

Practical Features

Materials are easy to manipulate, well-stapled and in a non-glare page with good contrast effect between the printed word and the page. Materials are easy to use and distribute. The test package ("Planning for Success" folder) provides a pleasant and sturdy arrangement of these materials, as reported (page 5) in the ACT ASSET Action Guide:

Left pocket inserts (front to back)
Educational Planning Form
Answer Sheet(s)
Assessment Booklet
Scratch paper

Right pocket inserts (front to back)
Educational Program Major Code List
Catalog
Campus Resource List
Faculty Course Placement Recommendations
Success Behavior Checklist
Time Management Chart
Registration Worksheets/Guidelines
Plus additional resources (See Action Guide for suggestions)

The package also includes information (advertising?) about a career film, a microcomputer enhancement for local scoring, an Action Guide, an educational planning form, a testimonial, and a copy of the Study Skills Inventory Booklet. Each of these are examined in the following paragraphs.

The flyer on "The Career Journey - A film introduction to the World of Work," available from ACT DISCOVER Center, 230 Schilling Circle, Hunt Valley, MD 21031 [tel. (301) 628-8000] was neither ordered nor reviewed.

A one-sheet, two-sided flyer announces the availability of the microcomputer option for locally scoring student optical mark answer sheets. Another four-page flyer, "An Introduction to the ACT ASSET Microcomputer Scoring/Reporting System Software" are advertisements for the products. Information is limited to advertising as to what an institution could accomplish with this option. There are no reports on users, advantages etc.

The fact sheet on microcomputer, optical mark reader and software specifications allows the reader to make a decision about the feasability of the microcomputer option, the cost, and the all-important computer configuration to ensure compatibility

to produce the desired institutional data and student report. The flyer ends with an actual dot matrix copy of what the student printout would look like.

Inclusion of general information about the optical mark reader suppliers, such as where to write or call for more information, would help the reader to gather the facts to make an informed decision. Also, an additional sheet explaining the codes and information provided in the sample student report would do much to highlight the facts about the advantages to this style of reporting. While it is possible to gather such information elsewhere (see for example 'Action Guide" page 1) it would be more convenient and probably meaningful for the reader to have a physically closer association between the student report and what it would mean to the student and to the institution.

Even at that the information in the Action Guide is more part of a marketing strategy to lead the reader to appreciate the student report options than it is complete enough information to allow the reader to make informed decisions.

> The ACT ASSET Program also incorporates a research support system for accountability, placement, and retention information. The two key features of the system are an Ability Profile Report for students in specific programs or majors and Grade Experience Tables relating assessment results to course grades (up to ten locally selected courses) to provide localized placement information.

Making a presentation to a committee, for its approval, requires that the material be re-grouped into a coherent and logical presentation. Asking members to follow along by having to leaf back and forth detracts considerably from the presentation. Perhaps if the package of information were to follow the flowchart, as the one on page 4 of the Action Guide, the presentation problem could be significantly reduced. It would appear that a separate, more detailed chapter is necessary to better convey the information about the student report form. Perhaps the testimonial from Belleville Area College, also found in the folder, could serve as a prototype of this chapter. Obtaining feedback from user institutions about the materials in this chapter would do much to help convince potential users of the generalizability of such results. Testimonials are effective appeals but they don't convince.

The "ASSET Educational Planning Form - Background and Plans Summary" is an efficient example of how institutions are to gather and report information about student expectations, aspirations and needs. A microcomputer version of this questionnaire has much appeal for the Registrar or Records' Office. Modifying the software program to record student results directly on this sheet would facilitate keeping records. The ACT

ASSET program needs to convince the support and professional staff but it also must offer very real advantages to the Registrar or Record's Office to motivate the costly changes and additions to current procedures.

Finally, a copy of The ACT ASSET Study Skills Inventory Booklet is included. This material was tested and a separate review is provided since the nature of "validity, reliability and norms," which are appropriate to review the ASSET instrument must give way to the more general "objectivity, comprehensiveness and generalizability" criteria that are appropriate for the review of a survey instrument. The report on the review of the ACT ASSET Study Skills Inventory Booklet is to be found in Appendix 1.

General Type

The ACT ASSET is an achievement test. The test builders intend to test for a maximum of adaptation and transfer of ability (reasoning and general educational development) but the content reveals a strong subject-matter proficiency. The test is strongly influenced by direct training in the American high school programs. The influences from the high school training are so explicit in the question and answer stems, especially in mathematics, that the ACT ASSET loses all potential to act as an aptitude test.

Date of Publication

1986 with normative data from data generated in 1983-85.

Cost: Booklets & Answer Sheet

The prices, all in 1987 US dollars, for purchasing test materials depend on the number ordered and on scoring options. The Self-Score answer sheet, glued to a self-carboning master answer sheet, records student answers and allows hand corrections. This feature is adequate for small batches or for individual administration, 'stragglers' or late registrants may be processed with such a self-carboning scoring sheet. However for large numbers of students the time required to separate, correct and record information is very cumbersome and may very

well defeat one of the major advantages of this procedure: rapid feedback to students and institutions. In such cases one of the two following options seems more realistic.

A Machine-Scoring System is available, through ACT ASSET, for large jobs. The turn-around time for this service is not mentioned. Our experience has shown that the Order/Shipping turn-around is excellent (24 hours). We may reasonably assume that the "Rush Handling", for an additional charge, must also be excellent. The machine scoring fee is included in the purchase price of the test materials under this option.

A very nice feature of this service is that ACT ASSET may also allow institutions to process locally their own students by using a microcomputer and an optical mark reader. Specific microcomputer and optical mark reader information is listed to facilitate making such decisions. The ACT ASSET Microcomputer /Scoring /Reporting System Software allows institutions to process, store and report the information on student answer sheets. All-in-all this option is probably the most innovative since it allows institutions autonomy in preparing their own norms very rapidly. In this manner data about current student population may be used.

The prices, effective to 8-31-87, as given by ACT ASSET, are:

For the Test Booklet: (Sold in packages of 25 reusable booklets)	$ 12.50
For the Microcomputer Software:	$450.00

For Answer Sheets: Prices vary from a listed low of $1.85 for the microcomputer answer sheet for 20,000 or more, to $2.50 for either the self-score or the ACT machine score service, for 1 to 499 sheets. An estimate of costs is available by writing ACT and asking for 'Order Form' information. The sheet they send provides a clear and brief statement about availability and pricing.

Scoring Services Available and Cost

In option 1 "Self-Score", the tests may be self-scored by separating the carboned copy glued at the edges to the student's answer sheet. The price for this self-carboning answer sheet varies from $2.50, for 1 to 499 copies, to $2.00 for 20,000 copies. A special price is available for 25,000 or more copies.

It is possible to have ACT machine score the answer sheets and return results to institutions. The price is the same as for the self-score carboning method. Of course, large groups (100 or

more students in our experience) would require this service.

A third option is to use an optical mark reader attached to a specifically configured microcomputer to machine score optical mark answer sheets. Making one's own machine-scores locally reduces costs and time.

Whatever option is chosen, ACT ASSET offers the services and sells the answer sheets. It may be possible for users of the microcomputer system to buy the Scantron half-sheet reader and half-size, double-sided answer sheets to produce its own local machine score. Additionally, Scantron has a software package [3] that can be used to read and store the information. All that is required are the services of a programmer to make necessary adjustments. This procedure makes the use of the Scantron much cheaper (about 60% less) and keeps the answer sheet cost much lower (about 15 cents per student instead of the $1.85).

A bonus to getting the local programmer to re-route the Scantron Half-page Optical Mark Reader to read ASSET Results is that the savings on the purchase allow for buying a top notch statistical treatment software package such as SPSS/PC+ or SAS [4]. The ASCII [5] file produced by the Optical Mark Reader may be imported by the statistics program to allow all the possible analyses desired. This could still be done with the current ASSET configuration and software but the purchase price of the statistics software would be in addition to the expenses incurred. Since the programmer has to get involved anyway why not add just a little work for much savings?

Time Required

Each of the sub-tests are timed. The five sub-tests allow for 99 minutes of testing time plus the time to distribute and collect the materials, and to allow the time to read the directions. It seems reasonable to expect two and one-quarter hours, as ACT ASSET suggests (Action Guide, p.6-7), to carry out the orientation, assessment and advising effort for the basic sub-tests (Language Usage, Reading Skills and Numerical Skills).

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3. "Scanscore II: The Test Scoring and Gradebook Program"

4. See 'SPSS' or 'SAS' in the References for addresses. Also see Carpenter et al (1984) for one of the latest and best reviews of such products.

5. ASCII = American Standard Code for Information Interchange

The 'Advanced' sub-tests (one of the three levels in the Algebra sub-test, and the Advanced Language Usage Skills) require an additional "85 minutes". Thus the total time needed would be in the neighborhood of 3 and 3/4 to 4 hours.

While it may be possible to actually schedule the test so that students write all five of the ACT ASSET sub-tests in one sitting it would seem preferable to avoid mental and physical fatigue by administering the basic skills' sub-tests at one sitting and have another sitting for the 'advanced' skills orientation, assessment and advising. This translates into two - 2 1/2 hour sittings.

Purposes for Which Evaluated

To find a suitable means of assessing the cognitive entry characteristics of students, especially the underprepared, as they enter CEGEP (College d'enseignement general et professionnel) to counsel and direct them to appropriate resources.

There are strong positive statements, in all justice, to be made about the ACT ASSET. Our concern is basically one of determining the adequacy of content, with respect to our curriculum, and then of establishing if the proportion of questions and items that survive make adapting ACT ASSET feasable. Thus, we are not evaluating the adequacy of the test as such, but rather trying to ascertain to which degree it could be used in Quebec on students who matriculate in English-speaking institutions.

Chapter 2

The Content Analysis of the ACT ASSET

Introduction

The ACT ASSET begins with a one paragraph statement of purpose. The implication is that students are responsible. With the information generated by test results students "... may build a solid plan for success in the educational options you choose to pursue here."

The second paragraph explains how the results will be used to accomplish this goal: "This information will help you identify areas in which you may wish to build your skills and will help you learn about resources at the institution (people and learning aids) that can help you reach your goals."

Implicitly the student may expect remedial workshops, tutorials, visits with learning specialists etc. A cursory examination of how institutions use the results is quite different. Students are placed into remedial or developmental education classes based on results. Thus institutions use the results to make decision for students.

We sent a brief questionnaire (see Appendix 2.) to user institutions (see Appendix 3.) to enquire about the actual use of ACT ASSET scores. Both of the persons who telephoned their replies were puzzled that we should want to use ACT ASSET without using the results to place students in remedial education courses. We felt that the statement of purpose, as given, led to some basis for students to suppose that results would be used for some sort of diagnostic evaluation. We suspect that students are being 'sold' the decisions made by institutions concerning them. We feel this is contradictory to the purpose of "...help(ing) you learn about resources at the institution. ..."

Of course this is not a problem with the test as such but rather with the uses of results made by institutions. However, the ASSET sub-title: "A Student Advising, Placement, and Retention Service" does use the word 'placement' and yet carefully avoids its use in the statement of purpose. One may easily argue that the word 'advising' is there also and carries

more 'weight'. We may think though that the highly emotional, stressing events surrounding registration and the status of the resource persons creates a strong demand for advising time. Consequently the quality of 'advising', given the usual institutional resources, is bound to be taxed; and, students may respond more to the decisions made by such high status persons at such time.

Breakdown of ACT ASSET Data

Description of ACT ASSET Sub-Tests

TABLE 1: Breakdown Statistics for ACT ASSET by sub-tests

	LangUsSk	ReadSk	NumerSk	AlgSk	AdvLanUsSk
Mean	49.548	26.463	22.125	15.684	28.090
Std Err	0.679	0.778	0.539	0.557	0.797
Median	51.000	26.000	22.000	15.000	28.500
Mode	52.000	18.000	20.000	14.000	30.000
Std Dev	6.222	7.043	4.824	4.947	7.040
Variance	38.709	49.610	23.275	24.475	49.563
Kurtosis	0.437	-0.912	1.168	-0.565	-0.134
S.E.Kurt	0.520	0.526	0.532	0.535	0.538
Skewness	-0.739	-0.114	-0.566	-0.087	-0.175
S.E.Skew	0.263	0.266	0.269	0.271	0.272
Range	30.000	27.000	27.000	22.000	32.000
Minimum	31.000	12.000	5.000	3.000	10.000
Maximum	61.000	39.000	32.000	25.000	42.000
Sum	4162.000	2170.000	1770.000	1239.000	2191.000
N	84.000	82.000	80.000	79.000	78.000
Missing	0.000	2.000	4.000	5.000	6.000

LangUsSk=Language Usage Skills sub-test.
ReadSk=Reading Skills sub-test.
NumerSk=Numerical Skills sub-test.
AlgSk=Algebra Skills (Elementary) sub-test.
AdvLanUsSk=Advanced Language Usage Skills sub-test.

TABLE 2: Breakdown Statistics for ACT ASSET by Verbal, Math and Composite Scores.

	VerbSc	MathSc	CompSc
Mean	104.000	38.053	142.040
Std Err	1.971	1.036	2.725
Median	106.000	38.000	142.000
Mode	109.000	34.000	158.000
Std Dev	17.184	8.974	23.597
Variance	295.307	80.538	556.796
Kurtosis	-0.511	-0.541	-0.538
S.E.Kurt	0.545	0.548	0.548
Skewness	-0.043	-0.228	-0.011
S.E.Skew	0.276	0.277	0.277
Range	69.000	39.000	101.000
Minimum	72.000	16.000	95.000
Maximum	141.000	55.000	196.000
Sum	7904.000	2854.000	10653.000
N	76.000	75.000	84.000
Missing	8.000	9.000	-

VerbSc=Combined Scores on Language Usage Skills, Reading Skills and Advanced Language Usage Skills sub-tests.
MathSc=Combined Scores on Numerical Skills and Algebra (elementary) sub-tests.
CombSc=Combined Scores on all sub-tests.

The size of the sample varies from 78 to 84 because the tests were administered over three days. Some students completed only some of the sub-tests and were not able to make-up the ones they had missed.

Purpose and Basis for Selecting Items

Mental Functions Represented

The language skill sub-tests rely on recall of fundamental grammatical rules. Performances are limited to deciding if changes are necessary and which of several alternatives offered is preferable. By relying on student recognition of materials performance is limited to mechanistic syntactical and grammatical corrections. The cognitive type of questions is mostly factual, with some applied, and little interpretive ones. There is a small percentage of questions (20%) which are of the intrepretive type in the Reading Comprehension 'passages'.

The numerical and mathematical skill sub-tests require the recall of procedures and formula to solve problems. An aptitude test is supposed to be self-contained. One is supposed to be measuring how well the student can operate on facts and information about a problem. The inability to recall or a misrepresentation in recall are confused, in these tests, with ability to operate on data. Questions of the type: if a * 4 = 8, then * = which arithmetic operations? would seem to be more appropriate for aptitude testing since they avoid this confusion.

All-in-all the ACT ASSET appears very dependent on previous curriculum. In this vein it would appear that this instrument is a low-profile achievement test that essentially operates to qualify students for further education on the basis of how well they have mastered 'the basics'. In this respect, these 'basics' are determined by American high school curriculum content.

Directions

The directions, per se, are adequate. The novel use of the 'Correct' ['C'] versus Incorrect ['I'] for recording student answers on the Language Usage sub-test required explaining. It is possible that this novelty coincided with its place on the answer sheet. Students are not familiar also with an optical mark answering sheet. The strict boundaries and mark recording generalizations acceptable probably contributed to the

ambiguity.

In any event it would seem preferable to have separate instructions about any special or novel answer recording approaches. It may also be a good idea to take representative samples of answer sheets, especially from those who reportedly score low, to make sure that the directions for recoding data were followed properly.

Test Design

Any test is bound to reflect the culture for which it is made and on which it is normalized. The ACT ASSET has provisions for institutions to make their own norms thus dealing with the second of these issues. ASSET probably did not intend for its instrument to be used anywhere else but in the United States. While this may liberate them of any export obligations it remains, nevertheless, that others who wish to use the instrument must meet import obligations. Such 'import' obligations refer to the cultural and linguistic realities of the country to which one plans to adopt the test . Specific to this issue is the curriculum in mathematics and English in the secondary or 'high' school level. Consequently some of the items in the ACT ASSET are okay as they stand, others need minor revisions, others must be replaced to reflect changes from the American to the Quebec math and English curriculi, and a few question- or item-stems are simply wrong.

The criteria for making such decisions were derived after consulting with the advisors for the mathematics and English curriculi of the Quebec high school programs. The report of the English language Coordinator maintains that the ACT ASSET language sections "... are quite contradictory in both content and approach to the established criteria for student achievement of the objectives of the Secondary English Language Arts I-V program" (Goodman, 1987). She words her defence this way:

> While I can well appreciate the important goals of the project on which you are working, I would caution that the "skills" tested in ACT ASSET, in the sections relevant to English, have little to do with a student's ability to persist in the context of his own learning; as well, the inference that "performance" in English amounts to strict recall of information and the ability to correct grammatical and syntactical errors, I would view as faulty. Although many students may be foggy about the structure of language, research suggests that this inability is developmentally appropriate; those of us fascinated or preoccupied with an analysis of the

structure of language (which is how I would loosely define "grammar") develop this ability in our twenties and thirties. Too, the gap between students' abilities as writers and their sophistication as viewers -or visual literates- may be attributed, in part, to our confusion about grammar and its place in our curriculum. At the very least, it seems to me that caring to communicate must proceed an attention to the mode, media and structure of what is communicated. When we employ language to represent experiences and as a medium for communicating with others, we learn to manipulate language to respond to various purposes, messages and audiences.

This approach to language and learning is fundamental to Quebec's Secondary English Language Arts I-V program. In the program, language is viewed as a system through which one communicates with others. As learning occurs in a specific context, or situation, students are given the opportunity to explore contexts which demand communication involving oral, written and visual discourse. Grammar and syntax are taught in specific contexts, contexts which are clear and relevant to the student. ...

Unless this type of testing (ACT ASSET) accurately reflects the pedagogical imperatives of Quebec CEGEPS for achievement in the language arts, I would strongly discourage its application. Clearly, in light of the foregoing, ACT ASSET is not compatible with our view of competence in the language arts at the secondary level. ...

The suggestion that these skills will relate to decisions about a student's academic persistence and performance may be based on a thin understanding of the complex behaviours, abilities and attitudes which favour student success in the content area of the language arts.

Ms. Goodman's comments about the philosophy and policy of the government with regard to the English Language Arts in the Secondary I-V program are quite different to those, we may suspect, which ACT ASSET relied upon. Ms Marjorie Gawley, Advisor in Education Development in the English Language, Office of the Deputy Minister of Education, has confirmed the comments by Ms. Goodman.

...I feel the whole test puts students in the position of reading uninteresting passages for the sole purpose of answering questions that have only one "correct" answer. The secondary program stresses the importance of reading and writing for a purpose in meaningful

contexts. (Gawley, 1987)

We recognize that another equally important and opposite case could be made by quoting other, especially American, State Boards of Education. Asking about the relevance of the ACT ASSET contents to the Quebec English Language Arts programs prompted a deeper, and unexpected basic political and philosophical aspect of such testing. To understand these reactions we relied on several expert opinions as to the objective basis for determining the relevancy of the content of the ACT ASSET to our English Language Arts program.

The reception to the mathematics sections of the ACT ASSET was more enthusiastic and supportive. The two major obstacles are the order in which these materials are presented and the quality of some of the test items. The order from elementary to intermediate to advanced levels does not correspond necessarily with our math curriculum. Some of the test items then must be re-organized within the hierarchy of concepts as taught in the Quebec Secondary math program. We did not expect to find items that would be misleading or simply 'wrong.'

Objectivity, Comprehensiveness & Generalizability

In an attempt to test the objectivity and comprehensiveness of the ACT ASSET we consulted several major study guides intended to help students prepare for the ACT or SAT. We reasoned that the publishers of such materials would have interest to ensure the widest possible base to capture as large an audience as possible.

We reviewed the materials presented by Bobrow (1982); Bright & Nuckolls (1983); Erdsneker & Saunders (1984); Gladstone (1984); Katz (1983); Lakritz (1985); and, Shapiro, Obrecht, Rifkind, Bright, Nuckolls, Levy,J.U. and Levy,N. (1985). Our comments may summarized this way:

1. The price of the guides burdens the disadvantaged and favors the middle class. The total price of the guides above is $59.60 US.

2. Monarch's "...writing the personal statement for your college application" may encourage students to produce 'form letter' types of applications just as the 'personalized' form letters for business. In other words simple rote memorization.

3. Monarch's 'Special strategies for problem areas' is indicative of the frontiers and parameters that publishers must explore to capture the potential buyer.

4. The extensity of materials suggests a good market. The dates of the publications suggests that 2 to 4 year-old materials are still adequate.

The most comprehensive and detailed presentation was made by Barron (Shapiro et al., 1985). Appendix 4, "Basic American High School English and Math Skills" presents a summary, bordering on paraphrase, of the English and Math skills that could be covered, according to these authors, in American High Schools. By comparing the ACT ASSET with such information we may arrive at a statement as to the relative objectivity, comprehensiveness and generalizability of the ACT ASSET.

ACT ASSET has few similarities with Barron's list. A casual comparison of items on the ACT ASSET reveals these not to be representative in either depth or breadth of High School curriculum. The ACT Technical Manual does not explain the rationale for choosing items.

Another comparison with materials in the State-run testing programs (Florida, Tennessee, New Jersey) reaffirms the credibility of these observations. Thus the lack of objectivity (and any rationale for the items selected), comprehensiveness (items not representative of the domain) seriously jeopardize the generalizability of results form the ACT ASSET.

Sample Characteristics

The following frequency distribution of variables was obtained with the SPSS/PC+ program 'Frequencies.'

1. Sex of Respondent: 27.7% males, and 72.3% females.

2. Number of Semesters in Cegep:
   - 2.1 First semester - 24.1%
   - 2.2 Second semester - 3.6%
   - 2.3 Third semester - 47.0%
   - 2.4 Fourth semester - 1.2%
   - 2.5 Fifth or more - 24.1%

3. Program Currently Enrolled in:
   - 3.1 Pure & Applied Sciences 7.2%
   - 3.2 Health Sciences 3.6%
   - 3.3 Social Sciences 47.0%
   - 3.4 Administrative Techniques (3 year program) 2.4%
   - 3.5 Commerce 26.5%
   - 3.6 Office Systems Technology 0.0%
   - 3.7 Exploratory 1.2%

3.8 Languages and Literature 7.2%

4. Language Spoken at Home:
   4.1 English 27.7%
   4.2 French 68.7%
   4.3 Other 3.6%

5. Language of Instruction in Secondary School
   5.1 English 59.0%
   5.2 French 41.0%
   5.3 Other 0.0%

There is little concern for those who speak neither English at home or who did not take English at the Secondary Level since all students must take a placement English and French test upon entering the Cegep. The English test results are to assess the likelihood of studying in English. Students are not admitted unless they can pass this qualifying test.

Chapter 3

Test Characteristics

Validation Against Criteria

Criterion Measures and Time Interval

Building an instrument is very time consuming, costly and requires the contribution of many types of experts. We felt that examining several major instruments might allow us to find one that we could adapt for the assessment of cognitive entry characteristics of CEGEP students. We proposed to draw upon the resources of such potential instruments before trying to build our own. It is the purpose of this section to state the nature of the test as compared to our needs. To do so we must examine the validity, reliability and generalizability of the items and general characteristics of the ACT ASSET.

Validity

Validity refers to asking questions which are known to be related to the problem under study. This includes face, content, concurrent and predictive validity.

Face Validity:

A question with face validity will not confuse the student with the words, grammar etc. of the language in which it is expressed. Furthermore it appears to relate to the topic which we are claiming to study. For example, a question on mathematical ability will have poor face validity if the student

has to suffer through linguistic hurdles. Face validity is necessary to encourage the testee to make a frank effort to respond. Otherwise the testee will think there is some alternate and possibly manipulative purpose to the one given in the test directions.

A major problem in this context is the absence of metricized information, especially for the math sub-tests. The standard notation, as will be outlined in the section on content validity, is to use spaces and commas and not decimals. Also, many of the language skill sub-tests use American trades, skills, locations, characters etc. These aspects considerably reduce face validity. The general reaction of students is that they have to keep remembering to "think American" when taking these tests. They question, quite legitimately, why they should be made to do so.

As we read earlier the Language Arts Program requirements in this Province are also different at a political and philosophical level. Students, trained in test-taking strategies, are anxious that such disjointed and isolated information about them could actually be used to make decisions to place them. Students needed to be reassured that such information would be primarily used to provide them with feedback as to differences between actual versus perceived levels of ability, and then to direct them to resources that could help them remove deficiencies.

Content Validity: Modifications, Deletions and Corrections to the ACT ASSET

See section on 'General Type', in Chapter 1, in which we discuss the fact that the ACT ASSET is primarily an achievement test. It relies heavily on training and subject-matter ability which detracts from its stated purpose of 'aptitude' testing. As we will see below many of the criticisms of the reviewers have pointed to problems with validity of content.

Content validity means that the question must relate to the topic and with the other questions within that topic. So a content valid question is one which has been shown, through item analysis, to contribute to the test score. Removing the question would subtract information. If, however, the cumulative function in factor analysis reveals that the question ads little, or duplicates material in other questions, then it has to be removed. The following observations have been reported by the reviewers, specialists in their own area, of specific parts of the ACT ASSET.

1. Modifications to the ACT ASSET LANGUAGE SKILLS' Sub-Tests:

1.1 Language Usage Skills:

Item #:	Modification:
48. "senior class"	"Secondary V class"
56. "State board"	"graduate from a Cegep program"

1.2 Reading Skills:

Item #:	Modification:
Text 1.	The dollar sign '$' follows the number and a space is used instead of a comma. So the $900 and $1,200 become 900$ and 1 200$.
Text 5 and questions 34, 35, & 39	36 000 and not 36,000; X-rays not X rays; post-secondary training and not post-high school training.

2. Deletions to the ACT ASSET LANGUAGE SKILLS' Sub-Tests:

2.1 Language Usage Skills:

Item #:	Motive for deleting:
48	The concept of 'senior class president' is not relevant since such elections do not take place in all high schools.
57-60	The concept of 'related scientist' and the '5,000' figure are generalizations and overestimates. The major objection is that such 'information' is meaningless outside of any context.
63	The use of the comma before the conjunction 'and' is not acceptable in Canadian English.

The following observations lead us to question the protocol between American and Canadian spelling and capitalization.

17	Capitalization and spelling of 'Advisor'. In general there is much variation in spelling, such as colour for 'color', license for licence, centre for center etc.
24	Capitalization of 'federal'.
38	Capitalization of 'Minister'.
48	Capitalization of 'senior'.
56	Capitalization of 'State'.

2.2 Reading Skills:

Item #s:	Motive for deleting:
8,14,24, 26,27,29 and 32	The reader is asked to make interpretations based on inferences about American culture. For example, how might Canadian students be reasonably expected to know about typical American 'pastime' for auto body repair workers [Text 4, #27]?

2.3 Advanced Language Usage Skills:

Item #:	Motive for deleting:
Passage II	T.S. Eliot and E.E. Cummings are not standard materials for Secondary Language Arts curriculum.
Passage III	Reference to the 'corruption in government' and 'Americans' must be replaced with our own political and cultural realities.
Passage IV	Item 28 is ambiguous. The choice of 'be active from within' or 'act within' would seem equally possible to the student who has not read Hamlet.
Passage V	Such American national heroes are not familiar to our students.

The use of professions as the basis for testing reading skills is laudable. However, the titles, job descriptions, salaries and working conditions, as well as the bias for American cities needs to be replaced with titles, descriptions etc. relevant to our cultural identity. Another major factor is that in Quebec most of the trade skills have unionized workers. The auto body mechanic trade is thus quite different, in occupational task descriptions, from that for the person who paints or re-paints vehicles.

In brief, it would seem preferable to retain the idea of the passage as a model and to replace all texts with descriptions of professions, trades and occupations within our own labor market realities. The descriptions in the Canadian Dictionary of Occupational Titles would be a likely place to begin this search.

The question/answer combinations for the 5 passages in the reading skills section are not evenly distributed for cognitive type and level of difficulty. The first difficulty is that they lack a title. Not only would this facilitate referencing but it would help create a mental set or 'theme'. The distribution of items according to the factual, applied or interpretive cognitive levels of items is presented in Table 3.

TABLE 3. Distribution of the cognitive levels of items on the ACT ASSET Sub-Tests.

Passage:	Factual	Applied	Interpretive
1. ('The Account Executive')	1-5,7	0	6,8
2. ('The Advertising Team')	9-11,15-16	12	13-14
3. ('Forestry Aides & Technicians')	18-21,23	17	22,24
4. ('Auto Body Repair Workers')	25,31	26-28,30	29,32
5. ('Dental Hygienists')	33-34,36-38, 40	35,39	0
# of questions of each type	24	8	8

The bias is towards a very low level of reading skill as reflected by the disproprotionate number of factual questions. We may more easily discover who has difficulties with reading skills but at the expense of knowing very much about the levels of achievement in the average or better student. In this respect the Reading Skills sub-test functions more as a means of discriminating the poor reader from other, better students, without knowing anything about the 'others'..

A major drawback to the Language Usage Skills score is the dichotomous answer choices with no correction for guessing. The validity of the results is seriously questionable when guessing can account for as much as half of the total score. The texts used in the Advanced Language Usage Skills sub-test, in the words of one reviewer (Gadbois, 1987):

> Au sujet de ces cinq textes (anonymes et sans titre) on doit se poser la même question que pour les descriptions de professions: l'adaptation qu'on se propose de réaliser pour l'usage des Québecois peut-elle permettre que l'instrument soit manifestement un produit importé, "Made in USA", tout comme un roman de Steinbeck qui, même traduit en français, parle américain et parle des Américains?
>
> [Our concern with reference to these five passages (all untitled and unsigned) is quite similar to the descriptions about trades given in the Reading Skills section: can we accept that a proposed Quebec version be so blatantly transposed, much like a novel by Steinbeck, which even translated into French, speaks not only American English but also solely about Americans?]

Other observations by Gadbois are that the first and third passages are simplistic. Surely there is ample material in English literature to replace these disjointed texts. This is perhaps a harsh judgment and one could more easily argue that

students should be able to wade through uninteresting and trite texts in search of meaning.

Also, he continues, passage two must be replaced and the works of T.S. Eliot and e.e. cummings be dropped. These are not standard materials in the Quebec English Language Arts curriculum. The passages about Hamlet and George Washington Carver could and should give way to more appropriate Quebec national figures such as Alphonse Desjardins and Armand Bombardier.

Dr. Gadbois, author of the Quebec adaptation of the College Outcome Measures Project (COMP) (JAFF) [6] suggests that too many culturally biased items in the ACT ASSET favors producing a parallel version rather than to adopt the ACT ASSET.

3. Modifications and Deletions to the ACT ASSET MATH Sub-Tests: The use of 'Elementary,' 'Intermediate' and 'Advanced' in the Algebra Skills would require some reference to our numerical notation ('412'; '522') for Quebec math course sequences. Thus the directions to the math sub-tests would have to be re-written to reflect this reality.

The general comments about the math sub-tests are that contents vary from elementary level to advanced math classes in Secondary V with much material needing revisions or replacement.

First, the metric system of measurement (S.I.) must be reflected in all texts, question and answer stems. For example, Numerical Skills questions 20 thru 23, and 28 thru 30; Elementary Algebra number 25; and, Intermediate Algebra, number 24 all need to be 'metricized.'

Second, all material in decimals needs to be revised to conform to the following convention: a '0' is placed before a decimal which should be replaced, in turn, by a comma. This means questions 6 thru 13 and # 27 in the Numerical Skills sub-test should be changed by adding a '0' and replacing the decimal with a comma. Numerical statements with commas need to be re-written with spaces. For example # 14 in the Elementary Algebra test should read 1600 or 1 600 but not 1,600. Also, the dollar sign follows the number such as in number 26 of the Numerical Skills sub-test: 15 000$ and not $15,000.

Third, the use of computational aids needs to be clarified. In the words of one reviewer:

---

6. Jalons pour l'analyse de la formation fondamentale (Gadbois, 1985).

For the mathematics sections, it should be explicitly stated as to whether or not calculators can be used. Some students have wrist watches with calculators 'built in'. In recent years, the use of calculators in class work, tests and exams has become the norm, especially at the higher levels.

Fourth, a different pattern of answers could be used for each of the three Algebra Skills. It doesn't require much insight to figure out that on the student self-score sheet all sub-test answers must be the same. Thus the test-wise student could indicate a higher level of the Algebra, answer questions to lower level Algebra questions and yet appear far superior than he or she actually is!

Finally, in the opinions of the reviewers, the following points are in need of attention:

1. NUMERICAL SKILLS:

1.1. Question 22 confuses a test of "... ability to use the scale with ability to apply the Imperial system of measurement."

1.2. Questions 1 thru 13 are "needlessly repetitious";

1.3. "There are no questions to determine ability in evaluating or simplifying arithmetic expressions using decimals and fractions together."

1.4. "A serious problem exists in question 24 with the use of the word 'average'. Does it refer to mean, median or mode? See also questions 30 and 32.

1.5. "It is debatable whether question 30 tests basic numerical skills. It is really a 'Physics' type question."

1.6. "Questions 26 and 27 are too similar. Perhaps adjusting the numbers in question 27 would suffice to improve this situation."

1.7. "Number 27: change 'state' to 'province'; 3% sales tax is a bit unrealistic; and answers should be written [to conform to 0,00 convention]."

2. ELEMENTARY ALGEBRA SKILLS:

2.1. "Among the directions given in this section, I suggest you include a statement such as the following: 'Because division by zero is not defined, the variables used in any rational expression will be restricted to those values which do not make the denominator zero.' Such a statement will eliminate the need to place conditional phrases in questions

such as nos. 17, 21 and 23. At times these phrases become complex and can be confusing to the student."

2.2. "Although this module tests Algebra skills, nevertheless, questions 1 thru 5, 7, 10, 14, 20 and 24 deal only with arithmetic."

2.3. "Question 3 could be misinterpreted because of an alternate definition for 'distance'. 'from A to B' implies a direction and could be interpreted as a vector quantity. The technical term applying to this would be 'displacement'. The 'distance between A and B' would be a positive value whereas the 'distance from A to B' or 'displacement from A to B' would be negative."

2.4. "Question 6 may not even be taught at a low level. Thus, it would be irrelevant at this level. It would seem more appropriate in the College Algebra Skills module."

2.5. "Question 18 is the same question asked in Numerical Skills module (question 32). Since students doing this module will have, presumably, already taken the Numerical Skills module; it seems as though a different question should be substituted in its place."

2.6. "Question 20 is a 'Chemistry' question involving ratios. This might not be easily understood by students who haven't taken Chemistry."

2.7. "Change '80 . 204' to '80 x 204'. The lone point could cause confusion."

2.8. "Re. nos. 17,21 and 23. Eliminate the leading phrase in each question."

2.9. "The instructions at the beginning refer to accompanying diagrams but there aren't any."

3. INTERMEDIATE ALGEBRA SKILLS:

3.1. "Eliminate the leading phrases in questions 1, 2, 5, 6, 9, 10 and 15 thru 17."

3.2. "Eliminate, in no. 7, the word 'set'."

3.3. "Response A should be revised [no. 16] to eliminate the complex rational expression."

3.4. "Question 2 has an unclear premise with 'For all y and z not equal to 0'. Why mention 'y' at all? Does it mean 'y doesn't equal 0'? What about 'x'?"

3.5. Question 6 doesn't mention the value of 'b'. Since answers must be deduced from the given information, and 'b' could be equal to '0', then none of the given responses apply."

3.6. "In question 16. 'For all z not equal to 0, x not equal to 1, ...' would be better than that stated."

3.7. "In question 19, arrows should be used on the graph! See page 25 #13 for a graph depicted poorly (although only with respect to arrows)."

3.8. "Question 22 must include 'a + b not equal to 0' or equivalenty 'a not equal to -b' in the premise. Without this condition none of the given responses apply."

3.9. "Question 23 has no answer if 'y' is greater than 'x'! Consequently as in Question 6 and Question 22 none of the given responses apply."

4. COLLEGE ALGEBRA SKILLS:

4.1. "Eliminate the leading phrases in nos. 9, 19 and 24."

4.2. "In question 14 replace the 'v' with an 'u'."

4.3. "A large number of questions [7, 10-11, 16-17 and 21 thru 23] are outside the high school program."

4.4. "There are no questions on trigonometry which constitutes a major part of the curriculum in Secondary V."

4.5. "Question 5 is a poor question in my opinion. Many patterns are possible, thus 'the eight term' is not possible."

4.6. "It would be better to ask: 'If $\log_a x=b^2$, then x= ?"

4.7. Questions 7 and 11 require knowledge of bases; while questions 15 and 25 deal with variation. These may not be taught, and as such, would be irrelevant."

4.8. "In the diagram with question 13, the x axis should have a scale."

Content Validity: Completion Rates with Basic Statistics for ACT ASSET

The following tables (4 thru 8) present information about the completion rates to assess the effects of speededness on performances. While we recognize that the most current procedure is to resort to some mixture between speed and power the Quebec testing procedures tend to stress more power than speed. Thus the student's completion rate is considerably lowered since he has been trained to be precise and rapid rather than rapid and precise.

The summary statistics presented at the end of each table tend to support the observations reported in the 'Completion Rate'. With the exception of the Language Usage Skills sub-test the effects of speededness appear to be important. Such effects for speededness are taken into account in the Discrimination and Difficulty Indexes (Tables 11 thru 15).

TABLE 4: Completion Rates on ACT ASSET
Language Usage Skills Sub-Test.

Value	Frequency	Percent	Valid Percent	Cum Percent
39	1	1.2	1.2	1.2
40	1	1.2	1.2	2.4
42	1	1.2	1.2	3.6
48	1	1.2	1.2	4.8
52	1	1.2	1.2	6.0
53	1	1.2	1.2	7.1
56	1	1.2	1.2	8.3
58	1	1.2	1.2	9.5
60	2	2.4	2.4	11.9
64	74	88.1	88.1	100.0
TOTAL	84	100.0	100.0	

Mean	62.429	Std Err	.553	Median	64.000
Mode	64.000	Std Dev	5.067	Variance	25.670
Kurtosis	12.499	S E Kurt	.520	Skewness	-3.581
S E Skew	.263	Range	25.000	Minimum	39.000
Maximum	64.000	Sum	5244.000		

COMPLETION RATE 74/84= 88.1%

TABLE 5: Completion Rates on ACT ASSET Reading Skills Sub-Test.

Value	Frequency	Percent	Valid Percent	Cum Percent
23	1	1.2	1.2	1.2
24	1	1.2	1.2	2.4
25	2	2.4	2.4	4.8
26	5	6.0	6.0	10.7
27	2	2.4	2.4	13.1
28	7	8.3	8.3	21.4
29	5	6.0	6.0	27.4
30	2	2.4	2.4	29.8
31	7	8.3	8.3	38.1
32	11	13.1	13.1	51.2
33	1	1.2	1.2	52.4
34	4	4.8	4.8	57.1
35	1	1.2	1.2	58.3
36	4	4.8	4.8	63.1
37	1	1.2	1.2	64.3
39	1	1.2	1.2	65.5
40	29	34.5	34.5	100.0
TOTAL	84	100.0	100.0	

Mean	33.750	Std Err	.588	Median	32.000
Mode	40.000	Std Dev	5.386	Variance	29.009
Kurtosis	-1.378	S E Kurt	.520	Skewness	-.104
S E Skew	.263	Range	17.000	Minimum	23.000
Maximum	40.000	Sum	2835.000		

COMPLETION RATE 29/84= 34.5%

TABLE 6: Completion Rates on ACT ASSET Numerical Skills Sub-Test.

Value	Frequency	Percent	Valid Percent	Cum Percent
20	1	1.2	1.3	1.3
22	1	1.2	1.3	2.5
23	4	4.8	5.0	7.5
24	6	7.1	7.5	15.0
25	4	4.8	5.0	20.0
26	3	3.6	3.8	23.8
27	6	7.1	7.5	31.3
28	8	9.5	10.0	41.3
29	9	10.7	11.3	52.5
30	2	2.4	2.5	55.0
31	2	2.4	2.5	57.5
32	34	40.5	42.5	100.0
0	4	4.8	MISSING	
TOTAL	84	100.0	100.0	

Mean	28.913	Std Err	.369	Median	29.000
Mode	32.000	Std Dev	3.304	Variance	10.916
Kurtosis	-.671	S E Kurt	.532	Skewness	-.690
S E Skew	.269	Range	12.000	Minimum	20.000
Maximum	32.000	Sum	2313.000		

COMPLETION RATE 34/84= 40.5%

TABLE 7: Completion Rates on ACT ASSET Basic Algebra Skills Sub-Test.

Value	Frequency	Percent	Valid Percent	Cum Percent
16	1	1.2	1.3	1.3
17	1	1.2	1.3	2.5
18	2	2.4	2.5	5.1
19	1	1.2	1.3	6.3
20	5	6.0	6.3	12.7
21	2	2.4	2.5	15.2
22	2	2.4	2.5	17.7
24	4	4.8	5.1	22.8
25	61	72.6	77.2	100.0
	0	5	6.0	MISSING
TOTAL	84	100.0	100.0	

Mean	24.013	Std Err	.250	Median	25.000
Mode	25.000	Std Dev	2.222	Variance	4.936
Kurtosis	3.369	S E Kurt	.535	Skewness	-2.075
S E Skew	.271	Range	11.000	Minimum	16.000
Maximum	27.000	Sum	1897.000		

COMPLETION RATE 61/84= 72.6%

TABLE 8: Completion Rates on ACT ASSET Advanced Language Usage Skills Sub-Test.

Value	Frequency	Percent	Valid Percent	Cum Percent
24	1	1.2	1.3	1.3
26	1	1.2	1.3	2.6
30	1	1.2	1.3	3.8
31	1	1.2	1.3	5.1
33	1	1.2	1.3	6.4
34	2	2.4	2.6	9.0
35	2	2.4	2.6	11.5
36	1	1.2	1.3	12.8
37	5	6.0	6.4	19.2
38	3	3.6	3.8	23.1
39	1	1.2	1.3	24.4
40	1	1.2	1.3	25.6
41	1	1.2	1.3	26.9
42	2	2.4	2.6	29.5
43	1	1.2	1.3	30.8
45	54	64.3	69.2	100.0
	0	6	7.1	MISSING
TOTAL	84	100.0	100.0	

Mean	42.231	Std Err	.556	Median	45.000
Mode	45.000	Std Dev	4.912	Variance	24.128
Kurtosis	2.899	S E Kurt	.538	Skewness	-1.836
S E Skew	.272	Range	21.000	Minimum	24.000
Maximum	45.000	Sum	3294.000		

COMPLETION RATE 54/84= 64.3%

After completing the tests students were asked to take a copy of the booklet and to circle words, phrases, items etc. with which they felt some confusion or difficulty during the testing. They were encourage to write in comments about any thoughts and feelings they had about the test, the procedures etc.

The content analysis of these results suggests a great deal of frustration with questions for which they had not seen the materials, for the absence of the metric system, and for culturally biased contents and contexts. In their minds the completion rates and scores reflected more these realities than any actual or potential abilities.

Concurrent Validity:

Concurrent validity refers to the fact that the questions and test scores should relate ['concur'] with other known tests and scores. In this respect it would have been enlightening to read about the concurrent validity of the ACT Language sub-tests and commercially available diagnostic reading tests such as the Helson-Denny test. In any event, the ACT Technical Manual does not report any concurrent validity.

We saw fit not to concern ourselves with the concurrent validity until we established the face, content and predictive validities. As it turns out the results for these validities does not warrant examining concurrent validity.

Predictive Validity

The procedure for building a test and then checking it against samples of persons known to possess the quality under study is referred to as predictive validity. For example, if a test were devised to accurately predict academic success then we would expect that those who have succeeded in Cegep would do very well and those who failed from Cegep would do very poorly on this test. The 'discriminative power' of a test determines its predictive validity. Once again this points to the need for complex statistical analyses but this time these can only be performed once a cohort of students have actually passed, failed or abandoned their Cegep.

Predictive Validity: Criterion Variable

Table 9 reports on the criterion variable breakdown while Table 10 reports on the significance of the Pass/Fail criterion to sub-test scores.

TABLE 9: Breakdown Statistics for Class Performances

	CsWkGr	FiExGr	CsGr
Mean	65.940	64.500	67.440
Std Err	1.775	2.596	1.644
Median	67.500	73.000	69.500
Mode	60.000	0.000	60.000
Std Dev	16.271	23.796	15.072
Variance	264.755	566.253	227.165
Kurtosis	5.983	1.379	8.470
S.E.Kurt	0.520	0.520	0.520
Skewness	-1.953	-1.430	-2.270
S.E.Skew	0.263	0.263	0.263
Range	89.000	95.000	90.000
Minimum	0.000	0.000	0.000
Maximum	89.000	95.000	90.000
Sum	5539.000	5418.000	5665.000
N	84.000	84.000	84.000
Missing	-	-	-

CsWkGr=Course Work Grades.
FiExGr=Final Exam Grades.
CsWk=Final Grades for the Course.

TABLE 10: Chi Square Analysis between Pass-Fail on ACT ASSET sub-tests and Pass-Fail in the Course (CsGr).

	Course Grade (CsGr) Passed	Failed	Chi Square	Significance
LangUsSk Passed	66	13	0.122	---
LangUsSk Failed	5	0		
ReadSk Passed	47	3	6.785	0.01 level
ReadSk Failed	24	10		
NumerSk Passed	52	7	1.158	---
NumerSk Failed	19	6		
AlgSk Passed	35	2	3.843	0.05 level
AlgSk Failed	36	11		
AdvLanUsSk Passed	39	3	1.161	---
AdvLanUsSk Failed	32	10		
VerbSc Passed	49	7	0.557	---
VerbSc Failed	22	6		
MathSc Passed	42	3	4.391	0.05 level
MathSc Failed	29	10		
CompSc Passed	48	7	4.122	0.05 level
CompSc Failed	23	6		

There appears to be an association between pass-fail on the Algebra Skills and Math Score and Composite Score, especially so for the Reading Skills sub-test, and course grade results (CsGr). Most likely the implication is that some courses tap more into basic skills than others and thus course performances relate more with such skills.

Poor results on the language sub-tests need closer examination to determine the presence of cultural /or linguistic biases that suppress the association between these sub-tests and course grade results. If we accept student responses at face value the problems with cultural and linguistic biases are serious.

Predictive Validity: Item Discrimination and Difficulty

The question number appears in parentheses and the two pairs of numbers are the raw scores of top 27% and bottom 27% from the student sample. The third line contains the item discrimination index which is to be interpreted as follows:

0.40 or larger very good item
0.30-0.39 only minor revisions, if any, are necessary
0.20-0.29 major revision necessary
below 0.19 reject item

The fourth line is the item difficulty index which is to be interpreted as follows:

> The midpoint between perfect (100%) and guessing (1/4 or 25%) is 62.5% or .625. The question is to ask: How discrepant is the difficulty index from this 'norm'?

CORRECTIONS for not completing the scale require adjusting N to calculate discrimination and difficulty indexes. When this is done the revised discrimination and difficulty indexes are listed with an asterisk (*).

The discrimination index for the Language Usage is zero with or without corrections for completion rates. Two of the 40 items in the Reading Skills have a good or better rating which increases to 14 when taking completion rates into account. Five of the 32 Numerical Skills discriminate if we take into account completion rates. The Algebra Skills reveals 9 of the 25 items discriminate when taking completion rates into account. Finally, only 5 of the 45 items in the Advanced Language Skills discriminate with completion rate taken into account. Thus the discrimination index for these scales is poor.

TABLE 11: Item Analysis Statistics - Language Usage Skills:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
23-16	22-18	19-17	23-23	22-22	20-18	22-21	19-14	22-21	13-14	23-19
.30	.17	.09	.00	.00	.09	.04	.22	.04	-.04	.17
.85	.87	.78	1.00	.96	.83	.93	.72	.93	.59	.91

(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
23-19	21-20	23-22	23-23	20-16	21-16	23-21	22-20	17-12	20-21	22-21
.09	.04	.04	.00	.17	.22	.09	.09	.22	-.04	.04
.96	.89	.98	1.00	.78	.80	.96	.91	.63	.89	.93

(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)
22-21	15-12	21-19	20-21	20-16	16-12	21-18	20-15	19-14	22-14	21-22
.04	.13	.09	-.04	.17	.17	.13	.22	.22	.35	-.04
.93	.59	.87	.89	.78	.61	.85	.76	.72	.78	.93

(34)	(35)	(36)	(37)	(38)	(39)	(40)	(41)	(42)	(43)	(44)
12-13	20-16	21-20	11-13	13-12	23-20	21-21	18-14	23-19	10-06	23-23
-.04	.17	.04	-.09	.04	.13	.00	.17	.17	.17	.00
.54	.78	.89	.52	.54	.93	.91	.70	.91	.35	1.00

(45)	(46)	(47)	(48)	(49)	(50)	(51)	(52)	(53)	(54)	(55)
18-13	23-17	23-20	17-15	20-14	22-20	15-12	19-09	22-17	22-18	20-17
.22	.26	.13	.09	.26	.09	.13	.43	.22	.18*	.14*
.67	.87	.93	.70	.74	.91	.59	.61	.85	.89*	.82*

(56)	(57)	(58)	(59)	(60)	(61)	(62)	(63)	(64)
08-08	15-13	02-16	19-15	16-09	13-09	07-06	17-15	17-10
.00	.10*	-.70*	.20*	.35*	.20*	.05*	.10*	.20*
.37*	.65*	.42*	.79*	.58*	.51*	.30*	.74*	.63*

TABLE 12: Item Analysis Statistics - Reading Skills:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
23-20	14-11	22-19	23-12	21-20	23-17	21-20	19-17	23-23	17-10
.13	.13	.13	.48	.04	.26	.04	.09	.00	.30
.93	.54	.89	.76	.89	.87	.89	.78	1.00	.59

(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
22-15	20-16	20-17	16-15	18-12	18-09	21-18	17-16	21-19	20-17
.30	.17	.13	.04	.26	.39	.13	.04	.09	.13
.80	.78	.80	.67	.65	.59	.85	.72	.87	.80

(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)
18-13	16-10	23-16	15-09	21-17	20-12	17-08	19-09	16-04	23-11
.22	.26	.30	.26	.18*	.36*	.41*	.45*	.57*	.63*
.67	.57	.85	.52	.84*	.71*	.57*	.64*	.48*	.89*

(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)
20-14	21-05	20-07	20-07	14-01	16-05	15-05	12-04	12-03	11-04
.33*	.94*	.90*	.93*	.97*	.92*	.95*	.76*	.95*	.78*
.94*	.76*	.92*	.96*	.58*	.88*	.95*	.76*	.79*	.83*

TABLE 13: Item Analysis Statistics - Numerical Skills:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
22-22	21-20	16-16	23-20	21-18	23-14	23-23	21-16	23-10	19-15
.00	.04	.00	.13	.13	.39	.00	.22	.57	.17
.96	.89	.70	.93	.85	.80	1.00	.80	.72	.74

(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
21-17	16-10	22-14	22-20	22-19	24-21	22-14	20-14	21-17	12-03
.17	.26	.35	.09	.13	.13	.35	.26	.17	.40*
.83	.57	.78	.91	.89	.98	.57	.74	.83	.56*

(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)
22-16	19-11	17-13	22-14	18-10	17-08	18-11	17-11	17-06	13-04
.26	.36*	.18*	.37*	.39*	.46*	.37*	.34*	.73*	.75*
.83	.67*	.68*	.82*	.68*	.64*	.76*	.80*	.77*	.71*

(31)	(32)
08-04	12-03
.35*	.90*
.52*	.75*

TABLE 14: Item Analysis Statistics - Algebra Skills:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
21-16	21-17	22-16	16-12	16-16	23-13	21-09	17-10	23-15	18-14
.22	.17	.26	.17	.00	.43	.52	.30	.35	.17
.70	.74	.70	.52	.70	.78	.65	.59	.83	.70

(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
21-15	22-15	15-14	21-13	21-08	21-07	17-03	18-07	15-11	18-05
.26	.30	.04	.35	.57	.61	.61	.48	.18*	.58*
.78	.80	.63	.74	.63	.61	.43	.54	.58*	.51*

(21)	(22)	(23)	(24)	(25)
16-07	15-06	20-12	14-07	07-09
.40*	.48*	.36*	.32*	-.09*
.51*	.47*	.73*	.48*	.37*

TABLE 15: Item Analysis Statistics - Advanced Language Skills:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
22-13	23-14	07-07	23-18	23-18	10-07	14-15	18-10	20-17	19-12
.39	.39	.00	.22	.22	.13	-.04	.35	.13	.30
.76	.80	.30	.89	.89	.37	.63	.61	.80	.67

(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
21-11	19-09	15-07	21-18	19-11	21-18	14-08	22-17	10-12	22-20
.43	.43	.35	.13	.35	.13	.26	.22	-.09	.09
.70	.61	.48	.85	.65	.85	.48	.85	.48	.91

(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)
19-12	21-20	23-12	18-13	18-13	21-10	22-17	14-12	14-03	23-18
.30	.04	.48	.22	.22	.48	.22	.09	.48	.22
.67	.89	.76	.67	.67	.67	.85	.57	.37	.89

(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)
18-08	22-15	17-05	19-14	20-14	18-13	16-09	08-09	20-19	13-01
.43	.30	.52	.22	.26	.22	.31*	-.05*	.05*	.60*
.57	.80	.48	.72	.74	.67	.56*	.40*	.98*	.35*

(41)	(42)	(43)	(44)	(45)
17-08	07-03	07-00	12-10	14-07
.45*	-.21*	.37*	.11*	.39*
.63*	.26*	.18*	.61*	.58*

Predictive Validity: Criterion Variable to ASSET scores

We begin with the correlations between ACT ASSET and the Study Skills Inventory with Course Work, Final Exam Grade and Course Grade. None are significant with Final Exam Grade (Summative Evaluation). Study Skills scores are not significantly related to any performance criterion.

It appears that Reading, Numerical and Advanced Language Usage Skills are related to Course Work. This seems reasonable given that students were regularly tested to determine their comprehension of the textbook. The test items were of three cognitive types: factual, applied and interpretive. We wished to reinforce reading comprehension by providing opportunities to take open-book multiple-choice tests. While this may seem 'easy' the distribution of results indicates a normal distribution.

TABLE 16: Correlations between ACT ASSET sub-tests and academic performances.

	Course Work Grade	Final Exam Grade	Course Grade
LangUsSk	0.1004	0.0594	0.1663
ReadSk	0.2065	0.1560	0.3414*
NumerSk	0.3387*	0.0783	0.3455*
AlgSk	0.2647	0.1353	0.2973
AdvLanUsSk	0.3095*	0.1746	0.4088**
VerbSc	0.2509	0.1608	0.3737*
MathSc	0.3304*	0.1203	0.3521*
CompSc	0.3096*	0.1678	0.4095**
SSITOT	0.0750	0.0642	0.0209

*=Significant at .01 level.
**=Significant at .001 level.

The following expectancy tables do not take into account omissions made by students as a function of conscious planning or as due to the effects of speededness. Thus, it is quite possible that many more students could have performed better with familiarity with the test format, directions, answer sheet etc. The effects of testwiseness and speededness are thus not taken into account. The following tables on expectancies then are rather conservative.

TABLE 17: Grade Experience and ACT ASSET Sub-Test Score

LANGUAGE USAGE SKILLS

LanUsSk TEST SCORE	Number Cases [Percent]	Percentage Receiving Each Criterion Grade Range				
		59 & less	60-69	70-79	80-89	90-99
60-64	76 [90%]	25%	26%	33%	16%	-
55-59	2 [2%]	50%	50%	-	-	-
50-54	2 [2%]	50%	50%	-	-	-
45-49	1 [1%]	100%	-	-	-	-
40-44	2 [2%]	-	-	50%	50%	-
35-39	1 [1%]	-	-	100%	-	-

Mean	62.429	Std Err	.553	Median	64.000
Mode	64.000	Std Dev	5.067	Variance	25.670
Kurtosis	12.499	S E Kurt	.520	Skewness	-3.581
S E Skew	.263	Range	25.000	Minimum	39.000
Maximum	64.000	Sum	5244.000	N	84.000

Over 90% of subjects scored 60 or above on the Language Usage Skills sub-test. And yet 25% of these students didn't earn a passing grade. In those few cases of low Language Usage Skills scores, all subjects earned a passing grade.

TABLE 18: Grade Experience and ACT ASSET Sub-Test Score
READING SKILLS

ReadSk TEST SCORE	Number Cases [Percent]	Percentage Receiving Each Criterion Grade Range				
		59 & less	60-69	70-79	80-89	90-99
36-40	35 [42%]	20%	23%	31%	26%	-
31-35	24 [28%]	38%	29%	25%	8%	-
26-30	21 [25%]	19%	24%	48%	9%	-
21-25	4 [5%]	50%	50%	-	-	-

Mean	33.750	Std Err	.588	Median	32.000
Mode	40.000	Std Dev	5.386	Variance	29.009
Kurtosis	-1.378	S E Kurt	.520	Skewness	-.104
S E Skew	.263	Range	17.000	Minimum	23.000
Maximum	40.000	Sum	2835.000	N	84.000

One-fifth of the students who scored in the 90% range failed the course. Only three students failed this sub-test and yet 13 failed the course.

TABLE 19: Grade Experience and ACT ASSET Sub-Test Score
NUMERICAL SKILLS

NumerSk TEST SCORE	Number Cases [Percent]	Percentage Receiving Each Criterion Grade Range				
		59 & less	60-69	70-79	80-89	90-99
30-32	38 [48%]	24%	29%	26%	21%	-
25-29	30 [37%]	27%	17%	43%	13%	-
20-24	12 [15%]	42%	25%	25%	8%	-

Mean	28.913	Std Err	.369	Median	29.000
Mode	32.000	Std Dev	3.304	Variance	10.916
Kurtosis	-.671	S E Kurt	.532	Skewness	-.690
S E Skew	.269	Range	12.000	Minimum	20.000
Maximum	32.000	Sum	2313.000	N	80.000

Nearly half of the students scored in the 95% range and one-fourth or 9 students failed the course.

TABLE 20: Grade Experience and ACT ASSET Sub-Test Score

ALGEBRA SKILLS

AlgSk TEST SCORE	Number Cases [Percent]	Percentage Receiving Each Criterion Grade Range				
		59 & less	60-69	70-79	80-89	90-99
25	61 [77%]	23%	23%	36%	18%	-
22-24	6 [8%]	33%	33%	33%	-	-
19-21	8 [10%]	25%	25%	38%	12%	-
16-18	4 [5%]	25%	75%	-	-	-

Mean	24.013	Std Err	.250	Median	25.000
Mode	25.000	Std Dev	2.222	Variance	4.936
Kurtosis	3.369	S E Kurt	.535	Skewness	-2.075
S E Skew	.271	Range	11.000	Minimum	16.000
Maximum	27.000	Sum	1897.000	N	79.000

TABLE 21: Grade Experience and ACT ASSET Sub-Test Score

ADVANCED LANGUAGE SKILLS

AdvLanSk TEST SCORE	Number Cases [Percent]	Percentage Receiving Each Criterion Grade Range				
		59 & less	60-69	70-79	80-89	90-99
45	54 [69%]	24%	22%	35%	19%	-
41-44	4 [5%]	-	25%	50%	25%	-
36-40	11 [14%]	27%	55%	9%	9%	-
31-35	6 [8%]	50%	-	34%	16%	-
26-30	2 [3%]	50%	-	50%	-	-
21-25	1 [1%]	-	-	100%	-	-

Mean	42.231	Std Err	.556	Median	45.000
Mode	45.000	Std Dev	4.912	Variance	24.128
Kurtosis	2.899	S E Kurt	.538	Skewness	-1.836
S E Skew	.272	Range	21.000	Minimum	24.000
Maximum	45.000	Sum	3294.000	N	78.000

All-in-all the Grade Experience and ACT ASSET Scores' Tables do not warrant using such scores to make decisions, with respect to eventual academic performances, about cognitive entry characteristics of students. The following section examines the strength of this association to determine how much better off we would be if indeed we did use information generated by such scores.

Predictive Validity: Strength of Association

A 10.7% reduction in error is obtained when ReadSk is used to predict final course grade (CsGr). All the other sub-tests vary from 1.5% (VerSc-CsGr) to 9.6% (AdvLangUs-CsWkGr) in their ability to reduce error in predicting any of the three dependent variables. Thus, the contribution of ACT ASSET sub-tests, combined verbal or math or both are not efficient in reducing errors in predicting academic performances.

TABLE 22: Measures of Association: Proportional Reduction of Error (Lambda) Based on Number of Items Actually Completed.

	Dependent Variables		
	CsWkGr	FiExGr	CsGr
Independent Variables:			
LangUsSk-COM	0.0641	0.0633	0.0667
ReadSk-COM	0.0513	0.0633	0.1067
NumerSk-COM	0.0267	0.0400	0.0282
AlgSk-COM	0.0641	0.0506	0.0667
AdvLanUs-COM	0.0959	0.0685	0.0435
VerSc-COM	0.0274	0.0274	0.0145
MathSc-COM	0.0429	0.0571	0.0455
CompSc-COM	0.0429	0.0429	0.0303

Reliability

Reliability refers to the consistency of results over time. Thus a reliable question is one which would make it possible for us to determine, over a given time period, the consistency of a subject's answer.

The Kuder-Richardson-20 formula, standard error of measurement and the confidence intervals provide the means for analysing the reliability of an instrument. Table 23 reports the results of such analyses.

TABLE 23: Basic Statistics, Internal Consistency (Reliability Coefficient), Standard Error of Measurement and Confidence Intervals for ACT ASSET sub-tests.

	Mean	Standard Deviation	Variance	Reliability Coefficient (KR-20)	Standard Error of Measrmnt	Confidence Intervals 95% [99%]
Language Usage Skills:						
EVEN	61.0845	4.3646	19.0497			+/-5.97
ODD	34.5070	2.5064	6.2820	-0.760	8.254	
TOTAL	95.5915	4.2848	18.3595			[+/-21.30]
Reading Skills:						
EVEN	42.5000	14.0195	196.5464			+/-2.86
ODD	46.6364	13.6993	187.6708	0.957	1.460	
TOTAL	89.1364	27.1491	737.0736			[+/-3.77]
Numerical Skills:						
EVEN	35.1071	10.6887	114.2483			+/-3.45
ODD	37.3929	10.0271	100.5427	0.867	1.759	
TOTAL	72.5000	19.4755	379.2951			[+/-4.54]
Algebral (Elementary) Skills:						
EVEN	29.4348	7.3595	54.1622			+/-3.76
ODD	34.2609	8.4838	71.9749	0.850	1.916	
TOTAL	63.6957	14.8112	219.3953			[+/-4.94]
Advanced Language Usage Skills:						
EVEN	45.5238	14.6479	214.5610			+/-4.12
ODD	52.3333	15.3275	234.9323	0.911	2.100	
TOTAL	97.8571	28.7338	825.6313			[+/-5.42]

Confidence Intervals= Std.Err.Measrmnt x 1.96 [95%] or x 2.58 [99%].

Reliability coefficients are very respectable for all sub-tests. The negative and significant correlation between the odd and even items on the Language Usage sub-test suggests some difficulties between each half. Possibly the low completion rate favoring omissions in one or the other of the odd/even dichotomy and/or the presence of linguistically or culturally biased items, again consistent to either the odd or even items, could account for such results.

Time Interval

Individual differences in sub-test scores are attributable to speed as S2c/S2t approaches 1.00. The effects of speededness are almost negligible for AlgSk, moderate for NumerSk and AdvLanUsSk, but appreciable for ReadSk and especially so for LangUsSk.

TABLE 24: Effects of timed ACT ASSET sub-tests on results.

	Variance of items completed (S2c)	Variance of total test scores (S2t)	S2c / S2t =
LangUsSk	25.675	38.709	0.663
ReadSk	29.009	49.610	0.585
NumerSk	10.916	23.272	0.469
AlgSk	4.936	24.475	0.202
AdvLanUsSk	24.128	49.563	0.487

Results

A 21.8% reduction in error is obtained when VerSc is used to predict course work grade (CsWkGr) [See Table 25.]. The combined verbal sub-tests (VerSc), as a matter of fact, represent the score that best reduces error in predicting all three academic performances (VerSc + FiExGr = 20.25%; VerSc + CsGr = 18.67%). All the other sub-tests vary from 6.3% (NumerSk-FiExGr) to 13.9% (MathSc-FiExGr) in their ability to reduce error in predicting any of the three dependent variables. Thus the contribution of ACT ASSET combined verbal sub-tests is moderately effecient in reducing errors for predicting academic performances. However, it remains to be shown how such results would stand up with other well-known verbal scales. That is, what information does this test provide that a good Reading Comprehension Test could not produce?

TABLE 25: Measures of Association: Proportional Reduction of Error (Lambda) Based on Total Score Possible on Sub-test.

	Dependent Variables		
	CsWkGr	FiExGr	CsGr
Independent Variables:			
LangUsSk	0.0641	0.1013	0.0667
ReadSk	0.0769	0.1266	0.1333
NumerSk	0.0769	0.0633	0.0800
AlgSk	0.0769	0.1139	0.0800
AdvLanUs	0.1282	0.1013	0.0933
VerSc	0.2180	0.2025	0.1867
MathSc	0.1026	0.1392	0.1333
CompSc	0.1282	0.1139	0.0800

How much help is the independent variable in predicting the dependent variable? Final Course Work Grade (CsWkGr), Final Exam Grade (FiExGr) and Course Grade (CsGr) are measured on an interval scale while the ACT ASSET sub-tests, the independent variables, have been reported on an ordinal scale. This allows us to compute the ETA statistic [Table 26.]. This measure assumes no linear relationship between variables and ETA squared can be interpreted as the proportion of the total variability in the academic achievement variables (CsWkGr, FiExGr, and CsGr) from knowledge of values in the sub-tests.

If we examine only the ETA Squared for sub-tests based on items completed by students, the knowledge of such scores does very little to help us understand the proportion of variability in either of the three dependent variables. We may interpret the

difference between ETA Squared for completed versus total scores possible for each sub-test (Table 26 vs Table 27) to mean that speeded tests, rather than pure power tests, are likely to help us better tease out the relationship between the dependent and independent variables.

TABLE 26: Measures of Association: ETA Squared Based on Number of Items Actually Completed.

	Dependent Variables		
	CsWkGr	FiExGr	CsGr
Independent Variables:			
LangUsSk	0.1442	0.1802	0.2137
ReadSk	0.1010	0.0244	0.1316
NumerSk	0.0052	0.0178	0.0022
AlgSk	0.0864	0.0729	0.0995
AdvLanUs	0.0316	0.0820	0.0407
VerSc	0.0658	0.0124	0.0333
MathSc	0.0097	0.0867	0.0069
CompSc	0.0574	0.0656	0.0373

The ReadSk accounts for 58.9% of the variability in CsWkGr. Weaker accounts (0.2 thru 0.3) are for VerSc and CompSc again in CsWkGr; while LangUsSk and VerSc explain a littel about FiExGr. LangUsSk, AdvLanUs and CompSc are the three highest, but still weak, sub-tests whose scores can help us better understand Grades actually earned.

TABLE 27: Measures of Association: ETA Squared Based on Total Score Possible on Sub-test.

	Dependent Variables		
	CsWkGr	FiExGr	CsGr
Independent Variables:			
LangUsSk	0.1708	0.2302	0.2017
ReadSk	0.5890	0.1910	0.1093
NumerSk	0.1104	0.0424	0.1161
AlgSk	0.1602	0.0320	0.1695
AdvLanUs	0.1650	0.0602	0.2081
VerSc	0.2449	0.2144	0.1940
MathSc	0.1617	0.1594	0.1640
CompSc	0.2352	0.1746	0.2381

Generalizability

A thorny question in test construction has always been the trade-off between detailed tables of norms and the life expectancy of such tables. The wealth of information derived from the standardization tables is directly proportional to the number of breakdowns that it allows. A standardized table that has many breakdowns is powerful over a relatively brief period of time. Given the length of time it takes to prepare such norms, it has become customary to sacrifice the number of breakdowns in favor of producing an instrument that will maintain reliability and predictive validity when used on populations other than the one on which it was standardized.

The advent of the micro-computer and adaptable optical scan answer sheet reading devices made it possible to resolve this trade-off. Norms derived from continuously incorporated incoming responses, from those who have or should have attained the target variable, provides formative feedback for the next cohort. In this manner the standardized tables are always up to date and appropriate. Thus, a major consideration in validation is to defend the adequacy of the tables one uses as a reference point for introducing change.

In this respect ACT ASSET innovates and receives its most favorable review. The idea of rapid, economical testing with provisions for local norm development makes it possible to make generalizations about the very sample that was used to generate the data. Thus the criticisms that used to refer to between-subjects variations are eliminated.

Additionally, the procedure allows institutions to share a common pool of information about its students. In this respect transfer of student profiles is possible. Finally, the idea of local norms would, I suppose, make it possible to devise some sort of 'value added' measurement to the program. Students tested at admission could be re-tested at graduation to see just how much 'progress' has been made.

The rapidity of scoring in the ACT ASSET, and the feedback of a personalized written report, increases institutional credibility and creates a favorable first impression [face validity]. The accountability and diversity of scales in ACT ASSET makes it possible for institutions to prepare and revise their own norms relative to diagnosing and predicting outcome.

ACT's [1] dedication to student placement for persistence and achievement; [2] incorporation of student antecedent, intervening

and contingent variables; [3] commitment to scientific procedures to study academic problems; and [4] impressive staff of technical experts made them very worthy of closer examination.

Procedure

The considerations for administering, supervising and collecting information all appear to conform to regular testing procedures. With the exceptions noted in Content Validity most procedures could remain the same.

We might suggest however to incoporate the answer sheet closer to the question. Perhaps an answer sheet that can be arranged in columns to correspond to questions on each page would do much to avoid the fatigue, constant 'place finding' to reduce one source of random error.

Test Items

In this area the generalization is particularly weak. Too many items need revisions. The difference in American and Canadian English rules as well as the metric system for computation requires re-writing the items. There are too many such revisions to be made. Also, the Reading Comprehension 'Passages' need to be replaced with changes reflecting our jobs, culture, programs etc.

In this respect, one reviewer's criticism to the effect that the test items requires the student to think like Americans seems warranted.

Results

Ninety-nine percent of our Cegep [7] clientele is between 17 and 20 years of age. ACT ASSET statistical workup included only 15%. There appears to be some confusion between the boundaries of continuing education, remedial education, professional

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7. Collège d'enseignement général et professionnel

development and 'normal' post-secondary education recent high school graduates undetake.

Chapter 4

Adequacy of ACT ASSET for Our Particular Purpose

Comments of Reviewer

The ACT ASSET is considerably different from other such instruments. First, the intention is to help students make sound decisions about college choices based on actual abilities. Even if, as very limited results show, the institutions take it upon themselves to use the results to make decisions for students, it remains that the ASSET people are among the first to assess the cognitive entry characteristics of students while systematically trying to avoid the testwiseness strategies. In this respect the face validity for the student to participate is strong.

The lower level difficulty of items places the emphasis on lower ability students but does nothing to differentiate them on the basis of mother tongue or learning English as a second language. It would seem more appropriate to encourage those who are native speakers of English to take ASSET. Students from other categories should take a more appropriate version, similar in intent to the Test of English as a Foreign Language.

The validity of the ASSET would be considerably improved if concurrent validity with reading comprehension tests was reported. The absence of such information doesn't make it clear just how much better off we could be with the ASSET instead of a Reading Comprehension test.

Our educational system does not include a post-secondary and community college niche. Students pass from six years of elementary school to five years of secondary school. All those who seek training as technicians and professionals must then accede to and graduate from regular CEGEP programs. Students are usually admitted on an open-door basis (high school performances and levels of courses attained are admission criteria). Students take and must complete regular courses in regular programs. There are no special 'remedial' or developmental education courses. If the student is deficient then these deficiencies must be removed through any of the many non-credit para-academic services and programs.

We fail to see how ASSET differs from other and better State-run programs, such as the New Jersey Basic Skills Assessment Program. Many other state-run programs (e.g. New York, Tennessee, Florida, California and Michigan) as well as institutional programs (e.g. El Paso Community College, North Dakota University, Genessee Community College, Glackamas Community College) report innovative techniques for the retention and transfer of students. The necessity to have a National coverage, as in ASSET has not been shown, and we suspect, has not been felt.

General Evaluation

The content analysis of the ACT ASSET, for purposes of assessing the cognitive entry characteristics of CEGEP students, in view of promoting their persistence and transfer, is not favorable. Problems with cultural and linguistic biases, representativity of items, absence of rationale for choosing items, and poor results in item discrimination with our sample, point to not using such an instrument.

The use of the microcomputer, optical mark reader, generation of local norms, absence of testwiseness strategies in general and the intent to help students help themselves drew our attention to the ACT ASSET. While we may disagree on the content of the instrument, for cultural and linguistic reasons, it remains that many American Open-Door Community Colleges, especially with large numbers of disparate students from diverse backgrounds, could use such a procedure. We question though the merits of the instrument with respect to other possible avenues, such as reading comprehension tests, state-run or institution instigated programs.

We were surprised to find several misleading statements in some of the questions and/or answers of several of the sub-tests. In spite of these it remains that too many passages, questions and answers would have to be changed or replaced. We seriously question the blind transfer of tests from one country to another without examining the content validity of the instrument with curriculum.

The idea of testing with the microcomputer and optical mark reader so as to build our own norms is retained. Such a procedure encourages institutions to monitor current student populations so as to coordinate needs with services.

Conclusion

The human resources potential that ACT has, the bias it has for helping students to accede to education, and the devotion to helping institutions to get involved suggests the production of a high quality instrument. We are unable to determine the actual quality of the instrument except to establish that it is an AMERICAN instrument. As such it is limited to American thinking, culture and practices.

Before adopting any instrument with a "Made in America" stamp on it, we need to be sure that it doesn't also imply "Made for Americans" only.

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Lakritz, J. (1985) Verbal Workbook for the ACT N.Y.: ARCO Publishing.

SAS, Write to: SAS Institute Inc., Box 8000, SAS Circle, Cary, North Carolina.

Scantron (Canada), Write to: Scantron (Toronto Branch), 400 Bentley Street, Unit 5, Markham, Ontario L3R 8H6

Scantron (USA), Write to: Scantron Corp., 1361 Valencia Avenue, Tustin, California 92680-9969 for a list of the national and international representatives for their products.

Shapiro, M., Obrecht, F., Rifkind, S., Bright, D., Nuckolls, E. Levy, J.U. and Levy, N. (1985) Barron's "How to Prepare for the ACT", N.Y.: Barron's Educational Series.

Sparn, D. and Moddrell, R.C. (No date) "Success Services through ASSET at Belleville Area College" Presentation Summary, enclosed with ACT ASSET "Planning for Success" Folder.

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APPENDIX 1.

ACT ASSET Study Skills Inventory Booklet

These results of the ACT Study Skills Inventory were obtained from the same population of students, described in 'Sample Characteristics' of Chapter 2, who completed the ACT ASSET.

The following tables and comments begin with summary statistics about the distribution of scores; discriminant analysis to identify the questions on the basis of students with high versus low ACT ASSET scores; and, factor analysis of the 26 items retained to make the generalizations about commonalities presented at the end of this appendix.

Distribution of Total Score on Study Skills Inventory (SSI):

1 Range was 131 to 212
2 Scores in the lower 27.7%, i.e. 131 thru 158, were recoded as 'Group 1'.
3 Scores in the middle of the distribution, i.e. 160 thru 178, were recoded as 'Group 2'.
4 Scores in the upper 25.3%, i.e. 179 thru 212, were recoded as 'Group 3'.

Discriminant Analysis of SSI

The 26 items, ranked from highest to lowest, are the rotated discriminant function coefficients which represent the items ordered by size within the function. Collectively these items represent 73.87% of the variance. The item number, the coefficient and the Study Skills statement are presented below. The words at the end enclosed in brackets refer to the construct tapped by the item question.

- Item36 .91677 "When referencing films, diskettes or cassettes, I easily identify the producer, the date of publication, and the publisher." [Identifying the who, what, where, why, when and how of information (5W&H)]

- Item11 .81198 "I seek counseling or tutoring to help me correct poor study habits." [Seeking Out Academic Advising Resources]

- Item45 .71868 "I find preparing for multiple-choice tests a difficult task." [Testwiseness & Test-Taking Strategies]

- Item9 .70120 "I finish my assignments before they are due." [Procrastination]

- Item52 .66699 "I take a test with the intention to work hard." [Locus of Contol: Ability and Effort versus Level of Task Difficulty and Luck]

- Item54 .66665 "Before starting a test, I look it over to plan how much time to spend on certain sections or questions." [Survey, Question, Read, Recite and Review (SQ3R)]

- Item48 .62703 "I do well on tests that I have studied for." [Locus of Control: Ability]

- Item49 .59270 "In preparing for a test, I review similar tests given during the term." [Study Skills: Formative Feedback]

- Item13 .54595 "When I study a textbook chapter, I turn the topic headings into questions and search for the answers as I read." [SQ3R]

- Item23 -.49779 "I try to detect major trends in graphs, tables, or diagrams." [Study Skills: Reading graphs, tables, diagrams.]

- Item31 .49773 "When reviewing past reading, I get lost in the details and lose sight of main themes." [Study Skills: Criteria for selection/retention.]

- Item7 .49145 "Social activities cause me to neglect homework assignments." [Competing needs for affiliation and achievement.]

- Item3 . 45242 "I follow a specific study schedule." [Study Skills: Timetable]

- Item47 .43708 "I follow a specific set of procedures when preparing for tests." [Testwiseness & Test-Taking Strategies]

- Item17 -.42821 "I need help from my instructor or classmates in relating tables to the text." [Study Skills: Understanding graphs, tables, diagrams.]

- Item18 -.40989 "I complete review questions when they are provided in my textbooks." [Study Skills: Formative feedback]

- Item37 -.40153 "When reading a journal article, I separate fact from opinion." [Study Skills: Criteria for selection/retention.]

- Item20 .28051 "My interpretation of charts agrees well with the text." [Study Skills: Understanding graphs, tables, diagrams.]

- Item27 -.23246 "I review notes from previous class sessions before attending the next session." [Study Skills:

Formative Feedback]

- Item53 -.20128 "I take a few minutes to check over my answers before turning in my test paper or answer sheet." [Testwiseness and test-taking strategies]

- Item51 -.17113 "In study sessions, I find that my classmates give better answers to possible questions than I do." [Locus of Control: Ability]

- Item32 .15511 "I get behind when taking class notes." [Study Skills: Notetaking]

- Item28 .07213 "After each class I type or rewrite my lecture notes." [Study Skills: Notetaking]

- Item38 .05615 "When necessary, I track down original sources (outside of the library) for information I need to solve a problem." [Study Skills: Using Resources]

- Item34 -.02064 "I use the library to get in-depth information for my course." [Study Skills: Using Resources]

- Item6 .00967 "I get too tired or sleepy to study efficiently." [Study Skills: Time and place]

Factor Analysis of the 26 revised SSI items

The following are Factor Analysis results performed on the 26 items generated by Discriminant Analysis of the 60-item SSI.

- Bartlett's Test of Sphericity is large (1.493E+10) and the associated significance very small (0.00000) so that we may safely reject that the population matrix is an identity.

- The Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy (MSA) is 0.52803 which meets the strict minimum for a valid factor analysis.

- The nine factors account for 62.7% of the variance, as Table 28 shows:

TABLE 28: Factor Analytic Results of 26 items from SSI

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
ITEMQR1	1.00000	*	1	3.73041	14.3	14.3
ITEMQR2	1.00000	*	2	2.67938	10.3	24.7
ITEMQR3	1.00000	*	3	1.82045	7.0	31.7
ITEMQR4	1.00000	*	4	1.54355	5.9	37.6
ITEMQR5	1.00000	*	5	1.51522	5.8	43.4
ITEMQR6	1.00000	*	6	1.44447	5.6	49.0
ITEMQR7	1.00000	*	7	1.33580	5.1	54.1
ITEMQR8	1.00000	*	8	1.14164	4.4	58.5
ITEMQR9	1.00000	*	9	1.09210	4.2	62.7
ITEMQR10	1.00000	*	10	.99145	3.8	66.5
ITEMQR11	1.00000	*	11	.88963	3.4	69.9
ITEMQR12	1.00000	*	12	.86281	3.3	73.3
ITEMQR13	1.00000	*	13	.82601	3.2	76.4
ITEMQR14	1.00000	*	14	.78615	3.0	79.5
ITEMQR15	1.00000	*	15	.74978	2.9	82.3
ITEMQR16	1.00000	*	16	.72210	2.8	85.1
ITEMQR17	1.00000	*	17	.62750	2.4	87.5
ITEMQR18	1.00000	*	18	.59668	2.3	89.8
ITEMQR19	1.00000	*	19	.49606	1.9	91.7
ITEMQR20	1.00000	*	20	.43527	1.7	93.4
ITEMQR21	1.00000	*	21	.39274	1.5	94.9
ITEMQR22	1.00000	*	22	.33241	1.3	96.2
ITEMQR23	1.00000	*	23	.31504	1.2	97.4
ITEMQR24	1.00000	*	24	.29237	1.1	98.5
ITEMQR25	1.00000	*	25	.21069	.8	99.3
ITEMQR26	1.00000	*	26	.17025	.7	100.0

- These factors relate to the following questions on the SSI:

FACTORS:	Principal Group	Secondary Group
Factor1	18, 34, 9	27, 47, 3, 7, 52, 49
Factor2	20,	31, 23, 17
Factor3	-37	53, -36
Factor4	45	-27
Factor5	49, 47	-28, 9
Factor6	45, 6	36
Factor7	11, 54	-7
Factor8	-3, 51, 6	---
Factor9	-38, 37, 3	---

- The presence of less than half (48%) of the residuals in the reproduced correlation matrix shows that the fitted model reproduces the observed correlations.

- Based on the discriminant and factor analytic results of the SSI and in the guise of a conclusion we observe:

    1. Students don't make effective use of formative feedback, as in using review questions in textbooks.

    2. Students are inefficient, misdirected or otherwise inappropriate in reading graphs, tables, charts and diagrams so as to select and retain important facts.

    3. Student testwiseness and test-taking strategies are deficient in that they don't know the 5W&H about selection and retention of facts.

    4. The student fails to recognize that review and organization of lecture notes after class provides formative feedback and contributes to testwiseness and the development of more effective test-taking strategies.

    5. Students who procrastinate in the review of former assignments and tests are, once again, not taking advantage of formative feedback.

    6. The final factors all bear the stamp of failure to develop testwiseness and test-taking strategies; selecting and retaining appropriate information; and, using resources.

APPENDIX 2.

Copy of Questionnaire Sent to Institutions Using the Microcomputer Version of ACT ASSET

- What initially led your institution to choose ACT ASSET?
- Might we know about some dissenting arguments that had to be overcome?
- What equipment are you using? We would like to know about the computer brand, its configuration, the optical mark reader, and the printer.
- How long has ACT ASSET been in use at your institution? What motivates your institution to continue its use? If not, why is it to be discontinued?
- Do you see any trends emerging since the use of ACT ASSET?
- How many students are involved?
- Does your college consider itself primarily as a vocational, professional or pre-university type institution? May we ask for a general breakdown of programs?
- Have there been any systematic studies or records kept on persistence and/or achievement before and after the use of ACT ASSET?
- Have any other institutions shown an interest in the use of ACT ASSET and the results that ensue?
- Would you recommend, based on your experience, that ACT ASSET be tried?
- We would welcome any additional comments which you think may be of interest to us.

APPENDIX 3.

ASSET User References [8]

*1. Hudson Valley Community College
Troy, New York 12180

2. Monroe Community College
1000 E. Henrietta Road
Rochester, N.Y. 14623

3. Belleville Area College
Belleville, Illinois

*4. Columbus Technical/Community College
Columbus, Ohio

*5. Sinclair Community College
Dayton, Ohio

*6. Macomb Community College
Warren, Michigan

*Indicates microcomputer system user.

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8. Thanks to ACT ASSET for providing this list.

APPENDIX 4.

Basic American High School English & Math Skills

Minimal Summative Achievement Expectations in English

1. Problems With Sentence Structures:

1.1. Sentence Fragments:

1.2. Run-On Sentences: Two or more complete thoughts are written into one sentence rather than into two or more sentences.

1.3. Errors in Agreement: A verb and its subject always agree in number.

1.3.1. Two or more singular subjects when joined by 'and' require a plural verb.

1.3.2. "There is vs there are" indicate that the verb precedes the subject. Identifying the subject makes it possible to determine if the singular or plural form of the verb is required.

1.3.3. Singular subjects followed by "accompanied by, along with, as well as, in addition to, together with, and with," require a singular verb.

1.3.4. Indefinite pronouns i.e. any, anybody, each, either, everybody, everyone, somebody, neither, require a singular verb.

1.3.5. When a group of entities or persons, commonly referred to as 'collective nouns,' is considered as a unit then the singular form of the verb is required.

1.3.6. "Several, many, 'a number of'" require a singular verb unless 'a number of' refers to many entities or persons, in which case a plural verb is required.

1.3.7. Nouns that refer to disciplines like Physics, Gymnastics etc., i.e. usually end in '-ics,' or that are commonly plural, such as news, are actually singular and require a singular verb.

1.3.8. "Either-or and neither-nor": Require a singular verb or otherwise agree with number and person of subject nearer to it.

1.4. Subject-Predicate Problems: The subject of the sentence must agree with the action of the verb, or the 'predicate.'

1.5. Parallel Sentence Structures: Coordinating the elements of construction within a sentence usually relies on the correlatives 'both-and,' 'either-or,' 'neither-nor,' 'not only-but also,' 'whether-or,' 'which-and which' and 'who-and who.'

1.6. Logical Transitions: The use of transitional phrases, such as "in short, for example, for instance, to sum up, as a result, on the contrary," and "it is true that" point the direction and allow a smooth transition while reading. The categories of transitional words are:

1.6.1. Addition: e.g. again, also, furthermore, moreover, once more, similarly, too;

1.6.2. Cause: e.g. accordingly, as a result, consequently, hence, so, therefore, thus;

1.6.3. Concession: e.g. certainly, granted that, it is true that, no doubt, to be sure;

1.6.4. Contrast: e.g. but, but then again, however, nevertheless, on the contrary, on the other hand;

1.6.5. Conclusion: e.g. in short, that is, to conclude, to resume, to summarize;

1.6.6. Example: e.g. for example, for instance, take the case of, an anecdote.

2. Regular and Special Usage of Verbs:

2.1. Principal Parts of Verbs: Writing the correct present, past and past participles of both regular and irregular verbs.

2.2. Tenses of Verbs: The consitent use of the active or the passive tense of a verb throughout a sentence.

2.3. Moods of Verbs: The appropriate use of the indicative mood to relate factual knowledge, information etc.; the imperative mood, to order, command, tell etc. someone to perform actions; and the subjunctive mood which is used to show conditionality such as doubt, uncertainty. The subjunctive mood is often recognized by the use of such conditional words as 'could, if, should or would.'

2.4. Gerunds, Infinitives and Participles: The infinitive is easy to spot since it is commonly preceded by 'to'. The

'-ing' ending on verbs means one of two things: Either they work as nouns, "gerunds" or they modify other nouns "participles".

3. Problems with Pronouns, Adjectives and Adverbs:

3.1. Pronouns: Pronouns come in three persons, singular or plural and with three cases. These pronouns are: I, me, mine and my; we, our, ours, us; you, your, yours; and he, she, it, his, hers, its, him, her, they, their, theirs and them.

3.2. Adjectives: An adjective helps describe a noun. The proximity of the adjective to the noun helps avoid confusion.

3.3. Adverbs: While adverbs are commonly thought to have an '-ly' ending there are exceptions, such as good and bad.

4. Wordiness, Diction and Word Usage:

4.1. Wordiness refers to unnecessary repetitions, redundancies, and, in general, using more words than are necessary to convey the thought contained in the sentence.

4.2. Diction refers to the suitability of illiterate, slang, colloquial, informal, and formal use of words.

4.2.1. Common diction problems are: "Could of" instead of "could have," and "ain't" instead of "isn't or aren't."

4.2.2. Less common diction problems are: "already-all ready,' 'alright-all right,' 'and etc.-etc.,' and 'than-then.'

4.2.3. Foreign language words and homonyms: For example, the plural form 'data' is much more commonly used then the singular 'datum'. Clear diction is necessary to distinguish between 'emigrate' and 'immigrate'. In some cases the diction is determined by the context, as with 'principal' and 'principle.'

5. Capitalization and Punctuation:

5.1. Capitalization:

5.1.1. Family names, Christian or given names, street names, knicknames and initials of names;

5.1.2. Books, plays, magazines, newspapers, documents;

5.1.3. Video and song titles, titles of persons;

5.1.4. Countries, institutions, historical events,;

5.1.5. Races, religions, religious events;

5.1.6. Languages;

5.1.7. Weekdays, months, holidays;

5.1.8. First word of a sentence or quotation;

5.1.9. No capitalization following the use of a semicolon or colon;

5.1.10. No capitalization of directions, i.e. east, west etc., and seasons.

5.2. Punctuation:

5.2.1. Comma: To separate what would be otherwise confusing or to set off items as in a list;

5.2.2. Semicolon: Usually precedes words like 'however,' 'moreover,' 'nevertheless,' 'subsequently,' or 'therefore.' The semicolon may also be used to set major lists of items which contain lists of specific items which are, as noted, set off by commas. The semicolon may also be used to indicate that there are two highly related but independent ideas in the one sentence.

5.2.3. Colon: When a list of items is to presented, an explanation to be offered, or a formal quotation is to appear next, then precede each by a colon.

5.2.4. Hyphen: Hyphenate compound adjectives that precede and modify nouns.

5.2.5. Apostrophe: Although apostrophes are used to show that a letter is missing in a word they are also used to show possession. They are used to indicate contractions in some subject-verb forms, as in "it's," for "it is," or "they're," for "they are."

6. Reading:

6.1. Reading comprehension, reported by measures of retention and rate, involve speed and reading level of both the text and the reader.

6.2. Reading tables, charts, graphs, diagrams, and figures is also necessary.

Summative Achievement in Mathematics

1. Simple Arithmetic Operations:

   1.1. Fractions and decimal equivalents: Converting fractions to decimals and vice versa.

   1.2. Averages and percentages: Calculating averages and percentages; or using averages and percentages to arrive at a solution given the size of the population.

2. Simple Algebraic Operations:

   2.1. Signed numbers;

   2.2. Simplifying expressions using rational numbers;

   2.3. Evaluating expressions using rational numbers;

   2.4. Performing operations on polynomial expressions;

   2.5. Factoring common algebraic expressions;

   2.6. Substituting by applying axioms, formulas, and equations to solve problems;

   2.7. Deriving implicit formulas to express tabulated observations, results etc.

   2.8. Solving algebraic linear expressions with one or two unknowns;

   2.9. Graphing an algebraic equation or deriving an algebraic equation by reading a graph.

3. Reasoning: Translating the verbal description or the results of an experiment into a mathematical relationship.

4. Geometry:

   4.1. Postulates and definitions;

   4.2. Complimentary, supplementary, vertical and right angles;

   4.3. Relationships of angles in triangles as well as the special cases in scalene, isosceles and equilateral triangles;

4.4. Congruencies;

4.5. Properties and areas of polygons;

4.6. Altitudes, areas of triangles and similar triangles;

4.7. Pythagorean Theorem;

4.8. Coordinate geometry; Properties and parts of the circle, relationships of arcs and angles.

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