Introduction

Overview

ACT™ continuously performs research designed to support the content validity of its educational achievement tests. This report presents the results of the 2002–2003 ACT National Curriculum Survey®, ACT's most recent comprehensive review of state educational standards documents, survey of educators, and consultation with content area experts across the curriculum.

The present report devotes one chapter each to English, reading, mathematics, and science, and a fifth chapter to the Standards for Transition® ACT introduced in 1997. This report is the fourth in a series that began with *Content Validity of ACT's Educational Achievement Tests* (1992). That report described ACT's Project Silver research program, a major initiative that underlies ACT's EPAS/Educational Planning and Assessment System®. We reported subsequent research in *Maintaining the Content Validity of ACT's Educational Achievement Tests (1998)* and *Content Validity Evidence in Support of ACT's Educational Achievement Tests: ACT's 1998-1999 National Curriculum Study* (2000).

Together, this series of reports confirms that the EPAS test specifications closely align with school curricula. Though state standards vary in details, they unite in the intention of preparing and encouraging all students to set and reach worthy academic goals, to explore their options for fulfilling work, and to realize their potential for a lifetime of learning. While the approaches vary, their themes are clear: schools should nurture all students' ability to think critically, to communicate cogently and appropriately, to read for information and pleasure, and to achieve literacy in mathematics and science. These are the themes addressed in the present report.

When we go beyond themes to details, we must ask, What should high school students be expected to know, and to be able to do with what they know, across the content areas? What knowledge and abilities do college faculty expect of incoming students? ACT's recent research indicates that the answers to these questions continue to vary among states, schools, and individual educators. National standards documents also express diverse priorities and emphases. ACT therefore seeks the commonalities among the curricula and standards, and we find broad areas of agreement about what skills and knowledge are important. We also poll large numbers of educators to gain the benefit of their sense of instructional priorities. And we confer with content and curriculum experts to help us interpret the results.

Most of the ACT staff members who contributed to this report have teaching experience. They all stay informed about content-validity issues by following the relevant literature, communicating with teachers and test item writers, visiting schools to observe classes, actively participating in professional organizations, and meeting regularly with content-area experts from outside ACT to review in detail all current EPAS test materials under development. Content-validity research is, in short, integral to the work of those who develop the EPAS tests.

ACT's EPAS/Educational Planning and Assessment System

In the 1980s, ACT developed through its Project Silver research program a system that would respond to the educational planning and assessment needs of students, parents, teachers, and administrators. To identify categories of essential information, ACT studied curricula being used in schools nationwide from Grade 7 through the college sophomore level. Completing this comprehensive study included:

- seeking the advice and counsel of college instructors, secondary school teachers, administrators, subject-area experts, and curriculum specialists.
- studying various critiques of education in the United States.
- reviewing state curriculum documents.
- analyzing textbooks widely used in middle school, high school, and college.
- surveying practicing educators across the United States about what is taught in their classrooms.

The study confirmed that there are skills and understandings, developed over time, that are vital to students' success in post-high school careers, whether the students choose to enter the workplace or to pursue a postsecondary education. The results of this study laid the foundation for the design and development of EPAS.

ACT conceives of growth in a student's educational development not as a series of discrete steps but as a continual process. Therefore, ACT's goal in EPAS is to produce an integrated system of assessments each of which is appropriate for a critical transition point in the continuum of a student's educational growth. EXPLORE®, for 8th and 9th graders, focuses on assisting in the transition to high school. PLAN®, for 10th graders, serves as a midpoint assessment of high school progress. And the ACT Assessment®, for 11th and 12th graders, assists in the transition to college.

EXPLORE is designed for use by all 8th and 9th graders. These students need to plan for high school, and EXPLORE helps them see and understand the opportunities open before them. EXPLORE gives educators the means to structure high school planning and career exploration and

provides a baseline to monitor students' progress. Through EXPLORE, a student's strengths and weaknesses can be identified early, and an appropriate learning plan can be developed.

PLAN provides a midpoint review of progress made in high school. Designed for all 10th graders, PLAN provides direction for educational and career planning and allows students to choose courses wisely to prepare to achieve their goals after high school.

The ACT Assessment is designed for 11th and 12th graders who are considering attending a college or university. By using the ACT Assessment, schools not only help those students who are going on to a college or university, but also receive a measure of the outcomes these students have attained by the time they reach their last two years of high school.

Evaluating students' strengths and weaknesses early in Grade 8 and continuing to assess progress through Grade 12, educators gain information necessary to guide students as they prepare for their high school and post-high school goals. As outlined in Table I.1, EPAS provides schools, parents, and students with:

- *a student planning component,* which engages students in a long-term planning process that begins with career exploration and educational planning in Grade 8, moves to career and educational planning in Grade 10, and concludes with students actively preparing for life after high school.
- *an assessment component,* which measures what students can do with what they know in English, mathematics, reading, and science. A fourth EPAS program, WorkKeys®, assesses the skills employers are looking for and helps students develop the workplace skills necessary to obtain the jobs they want after high school.
- *an instructional support component,* which offers teachers support in the classroom. For example, ACT publishes a set of instructional support guides tied to the EPAS programs (one each for Language Arts, Mathematics, and Science) and a series of interpretive guides related to ACT's Standards for Transition.
- *an evaluation component,* which provides information that allows schools to monitor and analyze student performance over time and to assess the effectiveness of school programs.

It is in keeping with ACT cofounder Dr. E. F. Lindquist's philosophy that each EPAS assessment is intended and designed to provide information for multiple purposes, including the evaluation of educational programs, the counseling of students about their course selections, the exploration of and planning for students' career choices, and (for the ACT Assessment) the selection of an institution and an academic area for postsecondary study or an area of employment. Again in keeping with Dr. Lindquist's thinking, although the EPAS test specifications necessarily list the content areas and skills tested, each assessment is designed to assess, not discrete skills in isolation, but the integration of skills and content knowledge. That is, all the assessments are designed to focus not on narrow objectives or course-specific knowledge, but on broad educational achievement and critical thinking developed over time across the curricular areas.

Table I.1
Overview of EXPLORE, PLAN, and the ACT Assessment

Testing program	Target grade	Components	Content areas
EXPLORE	Transition to High School Grades 8–9	• Student Planning • Assessment • Instructional Support • Evaluation	• English • Mathematics • Reading • Science
PLAN	Midpoint High School Review Grade 10	• Student Planning • Assessment • Instructional Support • Evaluation	• English • Mathematics • Reading • Science
ACT Assessment	Transition to High School Grades 11–12	• Student Planning • Assessment • Instructional Support • Evaluation	• English • Mathematics • Reading • Science

Philosophical Basis for ACT's Tests of Educational Development

In conducting its research, ACT observes the guiding principles that Dr. E. F. Lindquist applied in developing ACT's first program, the ACT Assessment Program, in 1959:

- The purposes of testing batteries should not be conceived too narrowly. A testing battery should comprise tests that provide information useful for many constituencies and many purposes: educational planning, career counseling, course planning and placement, instructional planning, program evaluation, and institutional planning at both the secondary and postsecondary levels. The needs to which well-constructed tests respond are hardly narrow: the need to enrich and improve students' educational experiences and the need to motivate student achievement.
- Tests of educational development should measure the student's readiness for further learning, by reproducing as faithfully as possible the complexity of the work students have done and will be expected to do in their future learning, both in and out of school. Such tests should be realistic and practical, and they should demand critical reasoning and thinking.
- Tests of educational development should focus not on innate abilities, but rather on the developed abilities that teachers nourish with their instruction and students cultivate by their own efforts. Such developed abilities, by their complex nature, cannot be measured in isolation. Valid measures of them must elicit acts of judgment that integrate many abilities working in combination. The tests must therefore be based upon the students' learning experiences in the core content areas of high school and college instructional programs, and they must determine what students can *do* with what they have learned, not simply ask for what was learned.
- Tests of educational development, rather than tests of aptitude, are the most useful tests for making course placement and other such decisions based upon instructional programs, precisely because such tests are linked to instruction. It is therefore incumbent on the test developer to design testing batteries that accurately reflect widely accepted educational goals judged important by educators for future learning both in and out of school.

The usefulness of Dr. Lindquist's guideposts continues to impress itself upon us as we survey the educational landscape. During the 2002–2003 ACT National Curriculum Survey, we found many opportunities to reaffirm Dr. Lindquist's propositions that tests of academic development should be versatile, complex, curriculum-based rather than aptitude-based, and consistent with widely accepted educational goals.

Observant of public policies such as the federal No Child Left Behind Act of 2001, and in accord with policy statements such as the Council of Chief State School Officers' recommendation that "schools, previously asked to ensure the development of basic skills, now be required to teach all students a new, broad range of cognitive skills demanded by the changing contexts in which students live," American schools have developed high academic standards and designed flexible curricula and instructional methods to match these standards. In the light of these initiatives, ACT intends to continue to provide information useful to students, parents, educators, and decision makers about individual learners' progress and the progress of the school, district, or state in the subject matter areas most critical to success in high school, college, and work.

Thus, underlying the EPAS tests of educational development is ACT's belief that students' preparation for further learning is best assessed by measuring, as directly as possible, the academic skills that students have acquired and that they will need to perform at the next level of learning. The required academic skills can be most directly assessed by reproducing as faithfully as possible the complexity of the students' schoolwork. Therefore, the tests of educational development are designed to determine how skillfully students solve problems, grasp implied meanings, draw inferences, evaluate ideas, and make judgments in subject-matter areas important to success in intellectual work both inside and outside of school.

Accordingly, the tests of educational development are oriented toward the general content areas of high school and college instructional programs. The test questions require students to integrate the knowledge and skills they possess in major curriculum areas with the information provided by the test. Thus, scores on the tests have a direct and obvious relationship to the students' educational progress in curriculum-related areas and possess a meaning that is readily grasped by students, parents, and educators.

Tests of general educational development are used in the EPAS testing batteries because, when compared to other types of tests, they best satisfy the diverse requirements of tests used to facilitate transitions from one educational level to the next. By contrast, measures of examinee knowledge of specific course content (as opposed to curriculum areas) do not readily provide a common baseline for comparing students' educational development for such purposes as advising, admission, selection, or the awarding of scholarships, because school courses vary so widely. In addition, course-specific tests might not measure students' skills in problem solving and in the integration of knowledge from a variety of courses.

Tests of educational development can also be contrasted with tests of academic aptitude. The stimuli and test questions for aptitude tests are often chosen precisely for their dissimilarity to instructional materials, and each test within a battery of aptitude tests is designed to be homogeneous in psychological structure. With such an approach, these tests might not reflect the complexity of academic work or the interactions among the skills measured. Moreover, because aptitude tests are not directly related to instruction, they may

not be as useful as tests of educational development for informing school counseling, course selection, and placement decisions.

The advantage of tests of educational development over other types of tests for use in school transitions becomes evident in the context of the changing educational system. Because many of the same complex skills that are taught in the schools are being measured, the best preparation for tests of educational development is school coursework. Long-term learning in school, rather than short-term cramming and coaching, becomes the best form of test preparation. Thus, tests of educational development tend to serve as motivators by sending students a clear message that high test scores are not simply a matter of innate ability but reflect a level of achievement that has been earned as a result of hard work and dedication.

Because the EPAS tests stress the complexity of intellectual work and the integration of knowledge from a variety of sources, students may be influenced to acquire the complex skills necessary to deal with these concerns. In this way, the EPAS tests may serve to aid schools in developing in their students the critical reasoning and thinking skills that are important for success in later learning and in life.

The tests of the EPAS testing batteries therefore not only are designed to accurately reflect educational goals that are widely accepted and judged by educators to be important, but are designed with educational considerations, as well as statistical and empirical techniques, given the first rank in importance.

Recognizing the growing importance of reporting detailed assessment results, ACT developed Standards for Transition for the EXPLORE, PLAN, and ACT Assessment programs in 1997. These Standards for Transition, which are presented fully in chapter 5, describe what students who score in various score ranges on the tests of educational development are *likely* to know and to be able to do in each academic area assessed in the EPAS tests: English, mathematics, reading, and science. The Standards for Transition are made widely available, free of charge, through schools and on the ACT website (www.act.org). ACT also offers, through its Standards for Transition Information Services (also described in chapter 5), reporting and instructional support services that can help teachers, curriculum coordinators, and others to interpret their schools' test results and use them appropriately in their teaching plans.

Investigative Process

The foundational evidence for the content validity of ACT's EPAS tests of educational development was obtained through Project Silver in the mid-1980s as described in detail in the 1992 report. This foundation was established with generous help from the many teachers who answered ACT's questionnaires, reviewed draft documents, and came to ACT's national office to meet and discuss testing plans with ACT staff. The foundation is built upon by the many teachers who write ACT EPAS test questions, which are then edited by ACT for administration. And the foundation is, in effect, subjected to scrupulous inspection several times every year—that is, each time ACT's regular test development procedures call for an extensive and stringent review of the tests. In the course of these reviews, conducted by ACT staff and by expert consultants (many of whom are themselves teachers) from outside ACT, each test question is critically examined more than twenty times. Moreover, all EPAS test battery forms are reviewed in detail to ensure that they match current test specifications and thus that their test content is representative of current high school and university curricula.

ACT pursues extensive additional research in the interest of assuring that the EPAS tests continue to be strongly supported by content validity evidence. In 2002–2003, this research took the form of a review of state standards, a curriculum survey, and consultation with content-area and curriculum experts.

In a curriculum review process similar to that described in the 1992 and 1998 reports, ACT (1) synthesized information gathered from state educational standards, (2) surveyed educators as to the skills they deem most important, and (3) consulted with content and curriculum experts about the results from (1) and (2) and to receive the experts' advice about the current status of the curriculum, of instructional practices, and of the appropriateness of the EPAS tests as measures of educational development.

ACT reviewed the latest standards available from the state departments of education (all states but Iowa, which does not publish state standards), most of which were published in 1995 or later. Some were prepublication drafts.

In the spring of 2002, ACT developed 22 surveys (15 for middle/junior high and high school levels, 7 for the postsecondary level) and sent them to 28,926 educators distributed among the four content areas included in the EPAS tests. Because many colleges and universities use ACT Assessment scores to help place students into entry-level courses, the postsecondary surveys were sent to instructors of typical entry-level courses. The surveys sent to teachers and instructors listed both process skills and content skills and asked respondents to rate each skill's level of importance on a scale of 1 through 5. The surveys sent to department chairs listed process skills, with the request that respondents rate each skill's level of importance on a scale of 1 through 5, and included questions about the curriculum in the department chair's school district.

The primary source ACT used in selecting these samples was Market Data Retrieval (MDR), a firm that provides mailing lists, database marketing services, and state-by-state elementary, secondary, and postsecondary school directories to the education market. Among MDR's services is a database of faculty members teaching in primary, secondary, and postsecondary institutions nationwide, indexed by the

courses they teach (e.g., *English Language Arts, Freshman English, Composition*). MDR updates this database yearly through the collection of class schedules and surveys of academic departments.

The ACT survey recipients were sampled from the MDR database, using selection criteria provided by ACT to ensure that a variety of geographic regions and schools were represented. First, ACT requested individuals who were identified by MDR as teaching specific secondary courses or freshman-level postsecondary courses. The courses selected were ones that had some of the largest numbers of entries in the MDR database, indicating that they (or their equivalents) were among the most widely taught courses nationwide. Second, ACT requested that 90% of the middle/junior high and high school recipients come from public schools, with the rest coming from private/parochial schools. This was to safeguard against the recipient pool being biased in favor of small, select institutions. Third, ACT requested that, within each of the four content areas, no more than one individual per school district (for middle/junior high and high school) and no more than one individual per postsecondary institution be included in the sample, so as to ensure that a wide assortment of school districts and institutions were represented in the recipient pool. (The only exception was that the third criterion was waived for lists obtained from the National Council of Teachers of English for use with the Writing survey.) Together, these three criteria were meant to ensure that survey recipients would represent a large number of schools and a variety of geographic locations. Neither the race, ethnicity, gender, nor socioeconomic status of recipients was considered in the selection of these samples. ACT received a total of 6,632 completed surveys, for an overall response rate of almost 23%. The results are analyzed in the content-area chapters of this report. These analyses incorporate the findings of the content experts with whom ACT consulted.

Special Concerns: Fairness, Cultural Diversity, and Effects on Instruction

ACT test developers continue to address three special concerns that bear on test content validity: the fairness of the test passages and test questions, the extent to which the diverse cultures of the United States are represented in the tests, and the influence of the tests on instruction.

A test of educational development must avoid privileging, or discriminating against, any group on any basis other than knowledge and skill in the content domain being measured. For example, if a test question required specialized background knowledge only certain groups would have, then that question would be unfair because it privileged some groups at the expense of others, and it would be technically flawed because it tested something (specialized background knowledge) other than the content construct purportedly being measured. ACT always has been sensitive to issues of fairness in testing. Statistical checks against unfair questions, and independent reviews intended to cull out unfair passages or questions, long have been integral parts of ACT's test development and test evaluation procedures. ACT continually refines its procedures so as to support the content validity of the EPAS tests by guarding against real and perceived sources of unfairness in the tests.

The United States has always contained a vibrant mixture of cultures. Our country's vitality has sometimes been measured by the very rivalries among its constituent cultures, while at other times it has been strengthened by the dignity and heroism with which these cultures have cooperated. In any event, it is a fact of cultural history that persons of many colors, origins, and creeds make up this land. Ignoring or slighting any group or groups misrepresents the cultural landscape. Justice and accuracy require that all cultural groups be represented in educational materials. Accordingly, ACT acquires test materials that reflect our national cultural diversity, and thus is able to ensure multicultural representation in its EPAS testing battery forms. ACT also brings prominent teachers and writers to ACT's national office to advise ACT test development staff on matters of cultural diversity. The content validity of the EPAS tests requires accuracy, and accuracy requires inclusiveness.

The effect that tests may have on instruction is a point of debate and concern for many educators and test developers. It is widely believed that tests inevitably influence instructional practices, and it is often feared that narrow tests may constrict curriculum and teaching. Some critics of standardized tests contend that such tests cannot measure critical reasoning and thinking and that they therefore discourage teachers from tackling challenging subject matter and create an incentive for teachers and students to stick to basic skills. However, ACT is confident that its EPAS tests of educational development do measure critical reasoning and thinking, and that these tests should encourage both teachers and students to reach into the most challenging subjects and instructional modes. ACT's Standards for Transition—descriptions of the skills and knowledge associated with EXPLORE, PLAN, and ACT Assessment scores—are an expression of that confidence. Described fully in chapter 5, the Standards are statements that describe what students who score in specified score ranges typically know and are able to do in English, mathematics, reading, and science. In addition, a series of ACT instructional support booklets indicate, in more detail and for each content area, how the EPAS tests require critical reasoning and thinking skills. These booklets both clarify the connections between critical thinking and the EPAS tests and suggest learning activities conducive to critical thinking. ACT knows that teachers know how to teach. In preparing these booklets we are not offering teaching advice, but sharing some interesting teaching ideas and resources. The booklets demonstrate that the EPAS tests measure critical thinking and that the best way to prepare for EXPLORE, PLAN, and the ACT Assessment is sustained and active learning.