

GRADUATE ATTRIBUTES: WHY AND HOW

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INTRODUCTION

A colleague of mine once remarked that there is one thing that everyone gets from college – OUT! Whether they leave college with a degree or with a handful of courses, all college students will eventually get out. Whether they drop out, stop out, flunk out, or go on to graduate or professional studies, they get out – one way or another.

When they do get out they will go on with their lives. Ultimately, these lives will include adult roles as parents, citizens, and workers. Those who get out of college will raise our nation's children and provide role models for the next generation of our citizens. In democratic countries, they will vote to determine who makes the rules we will all live under. Many of them will, no doubt, be among those who make the rules. Their efforts in the work force will contribute to the quality of our economic well-being. In essence, those who get out of college represent our future. It is important for us to understand, therefore, what students take with them when they get out of college. It is also important for us to understand what they do not take with them when they get out of college.

A substantial amount of research has taken place in the US to identify the skills, abilities, and attributes that result from participation in postsecondary education. Generally, this research has explored two dimensions of student attributes – cognitive and affective (Bloom, 1976). Cognitive attributes are those pertaining to students' knowledge, information, logic, or information processing skills. Affective attributes are those pertaining to students' attitudes, values, and beliefs.

How many mathematical facts, figures, and formulae students possess represents a cognitive attribute. Whether or not they are motivated to learn any more facts, figures, or formulae represents an affective attribute.

Both cognitive and affective attributes are developed during the college years. To some extent, these develop regardless of whether or not students participate in college. The mere act

of getting older and gaining experience brings about both cognitive and affective development. But the research consistently shows that cognitive and affective characteristics develop more rapidly for students who participate in postsecondary education (Astin, 1993; Pascarella & Terenzini, 1991).

In the past decade colleges and universities in the United States have begun to expand their outcomes assessment efforts, largely at the instigation of state legislative bodies and higher-education coordinating boards (Russell, 1997). In fact, prior to the 1970s, there were no states in the US requiring colleges and universities to measure student outcomes. It was only following the educational accountability movement in the 1980s and 1990s that we were forced by legislative and government agencies to engage in systematic outcomes assessment (Boylan, Bonham, White, & George, 2000).

Since the 1980s and the arrival of the accountability movement, a great deal of activity and information has been generated through assessment efforts. Most of the information we have gathered focuses on cognitive rather than affective attributes. The study of the development of verbal skills, mathematics skills, science, social science, and other subject matter skills have dominated our research on college students.

COGNITIVE DEVELOPMENT DURING THE COLLEGE YEARS

In 1991 Ernest Pascarella and Patrick Terenzini published a landmark work summarizing practically everything we know in the US about student learning during the college years. Pascarella & Terenzini (1991) investigated fifty years worth of research on cognitive gains among college students and found that there is one dimension on which the findings were, in their words, "unequivocal" (p. 63). In fact, the findings have been so consistent for so long that one wonders why we keep studying the same thing only to find the same results.

The overwhelmingly consistent message from fifty years of research is that college students make statistically significant gains in subject

matter knowledge and academic skills, particularly verbal and communication skills. Summarizing all studies measuring cognitive development using all typical college-level achievement tests, Pascarella and Terenzini concluded that college students gain nearly a standard deviation in their verbal skills during the freshman year. These gains continue throughout the college years. However, students gain only about one fifth of a standard deviation in mathematics skills during their freshmen year and improve little beyond that during their college careers (Pascarella & Terenzini, 1991).

At the end of four years of college American students have much larger vocabularies, much better verbal skills, and much better writing skills. Unless they are majoring in mathematics, science, or engineering, however, students' mathematical skills improve only modestly between the freshman and sophomore years. In fact, for students who do not major in quantitative subject areas, mathematical ability tends to stabilize between their sophomore and senior years (Flowers, Osterlind, Pascarella, & Pierson, 2001).

Our own smaller scale research at the National Center for Developmental Education bears this out. Our studies from one of our largest states, Texas, indicate that even the weakest students dramatically improve their reading and writing skills during their first year of college attendance (Boylan & Saxon, 1998). On criterion-referenced tests of composition and reading skills, the greatest cognitive gains among underprepared first-year students are demonstrated in writing. The next greatest gains are in reading. The least gain takes place in mathematics (Boylan & Saxon, 1998).

If there is one set of skills that seem to get better throughout the college years, it is reading and writing. If there is one set of skills that does not improve very much among American college students during the college years, it is mathematics.

I would speculate that our students' weak performance in mathematics results from the fact that American students typically enter college with extremely weak mathematics skills. According to the National Center for Education Statistics (1996), nearly 40 percent of *all* entering college students fail the placement examination in mathematics. In our studies of community college students, we found that nearly 60 percent of those entering two-year colleges fail the placement examination in mathematics (Boylan & Saxon, 1999).

Now I should point out that this is due in some measure to the egalitarian approach to admissions taken by many American colleges and universities in the service of educational opportunity. In the US, community colleges, technical colleges, and our less selective state universities do not require that students complete the college preparatory curriculum in high school in order to be admitted. They require only a high-school diploma and a set of scores on one of the two major college entrance tests (the Scholastic Assessment Test and the American College Test).

In addition to these instruments, most US colleges have their own assessment tests that students must take once they arrive. In fact, in 27 states, public institutions are required by law to assess students upon entry (Russell, 1997). These institutional assessment tests, however, are used only to place students in courses, not to determine whether or not they are admitted. So even though we have so-called 'admissions tests', getting high scores on these tests is not always required for admission. Even though we call what takes place in high school a 'college preparatory' curriculum, taking the entire curriculum is not really required to get into college in the United States.

According to McCabe (2000), only 42 percent of high-school graduates take a complete battery of college preparatory courses, yet 59 percent of these graduates go on to college. The preparatory courses these students most often lacked were in mathematics and science. So it should not be surprising that so many US college students fail the college mathematics placement examination. Nor should it be surprising that their gains in mathematics lag behind their gains in other subjects. Most American college students simply start further behind in mathematics than students of other nations.

The National Center for Education Statistics recently reported 30-year trends in mathematics scores of college-bound seniors. They found that between 1968 and 1998 these students' mathematics scores actually decreased from a mean of 516 on the Scholastic Assessment Test to a mean of 512 (National Center for Education Statistics, 2000).

In a comparative study of advanced mathematics skills among 17-year-olds in 16 Western industrialized nations, US students came in next to last. Not only that, but the mean mathematics scores of US students were 69 points below the international average (National Center for

Education Statistics, 2001). I might add that our host country, Australia, ranked at a commendable fourth place.

It is likely that US college graduates do not show much gain in mathematics because they begin college with such weak mathematical skills. And because the vast majority of non-science majors are required to take only one or two mathematics courses in college, their skills do not improve as they go through college. Our students start weak in mathematics and they do not put enough time on mathematics-related tasks during college to make up for this deficit.

On the other hand, US college students do gain somewhat more in their knowledge of science. There appear to be marked gains in science knowledge among US students during their college years (Thorndike & Andrieu-Parker, 1992). This may be due to the fact that US college and university curricula typically include a combination of half a dozen or more physical, natural, and social science courses as part of their general education requirements. Although non-science majors typically take only a smattering of biology, geology, physics, sociology, or psychology courses, the content of these subject areas is at least rooted in the scientific method, and some general scientific knowledge apparently results.

Interestingly enough, comparable gains in scientific-reasoning skills take place with students enrolled in both two-year and four-year institutions. Studies of community college and university students at the end of their second year indicate, not only that both groups of students increase their knowledge of scientific reasoning, but that there is literally no measurable difference between community college and university students on this dimension (Pascarella, Edison, Nora, Hagedorn, & Terenzini, 1996). The majority of this gain, however, appears to take place between the freshman and sophomore years with relatively little additional gain taking place during students' junior and senior years (Flowers, Osterlind, Pascarella, & Pierson, 2001). This is supported by the research of Cedje, Kaylor, & Rewey (1998), who found that community college students' grades in math and science decline following transfer to a university.

Another area where there are strong gains during the first year and thereafter is in subject matter skills. Students who take history courses in college make dramatic gains in their knowledge of history. Students who take psychology

courses make dramatic gains in their knowledge of psychology. And this continues to be true in practically all subject areas, particularly in the social sciences (Pascarella & Terenzini, 1991; Flowers et al., 2001). Of course this should come as no surprise. Improving subject matter knowledge in a particular content area is a major purpose of college courses.

A finding that is particularly noteworthy is that the cognitive gains discussed thus far do not appear to be a function of the type of college students attend. College students make significant gains in reading, writing, scientific reasoning, and social studies wherever they attend college (Pascarella & Terenzini, 1991; Pascarella et al., 1996; Flowers et al., 2001). It does not appear to make much difference if a student attends a community college, a non-selective university, or one of our most selective research universities, particularly for the first year or two of college (Boesel & Fredland, 1998). Regardless of where they attend school, there is no statistically significant difference in the quality of students' cognitive development at the end of two years of college (Flowers et al., 2001). This finding verifies the beliefs of many who argue that community colleges are one of the best educational values available in the US because they combine quality education with affordable prices (Boesel & Freland, 1998; Cohen & Brawer, 1989; McCabe, 2000).

Another finding of interest is that men appear to make greater cognitive gains in college than women. Using scores on the College Basic Academic Subjects Examination (CBASE) to measure cognitive gains for men and women between their freshman and sophomore years, Flowers et al. (2001) found that men consistently outscore women in all subject areas measured. The subject areas measured by the CBASE included English, mathematics, science and social studies. The greatest difference was found in social studies where women's gain scores from freshman to sophomore year were about half those of men (Flowers et al., 2001). The smallest difference was in mathematics, where women's gain scores were 82 percent that of men (Flowers et al., 2001). Similar findings were reported by Osterlind (1997) in his national review of scholastic achievement and by Baxter-Magolda (1998) in her review of national assessment results.

These data support the argument that postsecondary education in the US is a gender-based experience. A number of authors suggest that American postsecondary education may be

organized according to masculine rather than feminine learning styles and intellectual orientations (Baxter-Magolda, 1998; Belenky, Clinchy, Goldberger, & Tarule, 1986; Holland & Eisenhart, 1990; Whitt, 1992). For instance, recent analysis of data from the National Study of Student Learning suggests that American postsecondary classrooms are often unsupportive of women and that this may have a negative effect on women's academic development during the college years (Whitt, Edison, Pascarella, Nora, & Terenzini, 1999).

AFFECTIVE DEVELOPMENT DURING THE COLLEGE YEARS

Thus far, this paper has considered the cognitive characteristics of college graduates. As was noted earlier, the preponderance of research on graduate attributes has focused on cognitive development during the college years. There is, however, a growing body of literature focusing on the affective benefits of college attendance. This research indicates rather clearly that participating in and graduating from college has a positive influence on students' affective development.

A major way in which college impacts upon affective development is in student attitudes. It is generally supposed, for instance, that graduating from college has a liberalizing influence on students. Research by Milem (1998), however, indicates that although students form more liberal attitudes during the college years, the extent to which this takes place depends upon the college attended. Students graduating from smaller colleges or from Historically Black Colleges tend to express more liberal orientations. Students graduating from large universities, on the other hand, express less liberal orientations (Milem, 1998). So the supposed liberalizing influence of college is to some degree dependent upon the size and the type of institution students attend.

There is also evidence to suggest that the college experience has a somewhat more liberalizing effect for women than for men at all types of institutions. For instance, female college graduates are significantly more likely to believe in promoting racial understanding, helping others in need, and improving their communities than male graduates (Pascarella & Terenzini, 1991; Smith, Morrison, & Wolf, 1994).

Participation and graduation from college also has an impact on students' orientation toward self and others. As Chickering & Reisser (1993)

point out, a major developmental task undertaken by students in their college years is recognition and acceptance of the interdependence of human beings. In one of the earliest studies of the impact of college on students, Feldman & Newcomb (1969) found that college graduates do, indeed, have a greater awareness of their interdependence, the extent to which their actions influence others, and the extent to which they are influenced by the actions of others.

As students become more autonomous during their college years, they also recognize that their autonomy exists as part of a larger society (Chickering & Reisser, 1993). It is generally assumed that attending college contributes to a greater sense of responsibility among college graduates, and this appears to be true. As measured by a variety of psychometric instruments, by the time of their graduation students become less self-centered and more oriented towards others; more independent from the influence of parents yet more conscious of their responsibilities in a larger society; and more accountable for their own actions (Feldman & Newcomb, 1969; Levine, 1980; Pascarella & Terenzini, 1991).

Students' self-perceptions also appear to change as a result of the college experience. As some of you may know, the Higher Education Research Institute at the University of California – Los Angeles, collects data from thousands of randomly selected students entering over 500 different colleges and universities each year. Data is also collected from the same sample of college graduates to provide longitudinal analysis of student development during the college years. These data have been used in a variety of studies to determine the impact of college on student's self-perceptions.

These studies indicate that intellectual self-confidence improves for both men and women as they go through college (Pascarella & Terenzini, 1991). Both men's and women's social self-confidence improves, although the amount of improvement is greater for men than for women (Smith, Morrison, & Wolf, 1994). College students also graduate with greater achievement motivation than they possessed upon entry (Smith, Morrison, & Wolf, 1994).

Gains in these areas contribute to a generalized improvement in the self-esteem of college graduates. According to Pascarella & Terenzini (1991), a major benefit of college graduation for both men and women is increased self-esteem.

Students' reported self-esteem consistently improves throughout the college years although it appears to improve somewhat more for men than for women (Smith, Morrison, & Wolf, 1994). These findings are consistent with Baxter-Magolda's (1998) notion that attending college in the US is a gendered experience favoring men.

An affective attribute that has become particularly valued in the US, as in other developed nations, is a proclivity for lifelong learning. In this area, US college graduates fare well. In a study of 30,000 college seniors, Hayek & Kuh (1998) concluded that US college graduates' interests in lifelong learning are not only strong but they have remained so since the 1980s. This finding was echoed in a review of the literature by Kezar (2000) who found that interest in graduate and professional degrees among college graduates increased during the decade of the 1990s.

FACTORS CONTRIBUTING TO STUDENTS' COGNITIVE AND AFFECTIVE DEVELOPMENT DURING THE COLLEGE YEARS

It is clear that US students gain substantially in a variety of cognitive and affective areas during the college years. Because these gains consistently surpass those of students who did not attend college, they must be attributed to factors other than experience or maturation (Astin, 1993; Boesel & Fredland, 1998; Pascarella & Terenzini, 1991). In other words, attending college does make a difference. But what attributes of the college experience contribute to this difference?

The factor that appears to account for the greatest amount of both cognitive and affective change in college is the peer group affiliation. As Astin (1993) points out, students identify with and seek approval from the peers with whom they affiliate. The characteristics of college peer groups, therefore, may be expected to have a great deal of influence in the development of students attending college. Students who attend college, particularly those at residential campuses, spend most of their time attending classes, interacting, and socializing with peers of relatively high ability (Bishop, 1989; Boesel & Fredland, 1998) and with stronger than average achievement motivation (Milem, 1998; Newcomb & Wilson, 1966).

College students, therefore, are seeking acceptance and approval from groups of peers that value personal and intellectual competence.

This appears to have a reinforcing effect on students' development. As a consequence, research consistently shows that peers are the most significant influence on the development of students attending college (Astin, 1993; Feldman & Newcomb, 1969; Pascarella & Terenzini, 1991). Although college peers have a greater impact on the development of student attitudes (Astin, 1993; Milem, 1998), they also have a measurable impact on students' intellectual development (Astin, 1993; Chickering & Reisser, 1993; Pascarella & Terenzini, 1991).

Most academics assume that faculty members make a major contribution to students' intellectual development in college. This appears to be true. However, the influence of faculty is generally less pronounced than the influence of peers (Feldman & Newcomb, 1969; Milem, 1998). Although college and university faculty may be presumed to value intellectual growth more than students do, the impact of this valuing makes less difference in students' intellectual growth than the impact of peers.

Roueche & Roueche (1999), however, propose that the influence of faculty is greater on students with the weakest skills, particularly in community colleges. In other words, faculty may have a greater influence than peers on the development of weaker students, at least in community colleges. This view is supported by the research of McCabe & Day, (1998) and McCabe, (2000). It is also validated to some degree by findings from studies of college remedial programs indicating that those having the greatest success in improving student cognitive skills are also those in which faculty are well trained in instructional methods and techniques (Boylan & Saxon, 1998; Casazza & Silverman, 1996).

It should come as no surprise that the quality of teaching is directly related to the quality of learning in college (Angelo & Cross, 1991; Cross, 1976; McKeachie, 2002). One might speculate that one reason why college faculty have less of an impact on student intellectual development than might be anticipated is that relatively few of them receive any formal training in how to teach. University professors in the US, as in many other countries, are subject-matter experts, not teaching experts (Cross, 1997).

To the extent that the quality of teaching influences what students learn in college we know a great deal about how to improve student

learning. A full discussion of the characteristics of high-quality college and university teaching is beyond the scope of this paper. Nevertheless, it may be relevant to provide the following list of some of the more important research-based characteristics of the sort of quality-postsecondary teaching that is most likely to contribute to students' cognitive development.

- Emphasizing mastery learning (Bloom, 1976; Boylan, 2002; Cross, 1976).
- Integrating study skills instruction with content instruction (Boylan, 2002; Maxwell, 1997; Flippo & Caverly, 2000).
- Using active learning techniques (McKeachie, 2002; Perin, 2001; Silverman & Casazza, 2000).
- Practicing classroom assessment techniques (Angelo & Cross, 1991; Cross, 1997; McKeachie, 2002).
- Integrating critical thinking and content instruction (Chaffee, 1998; Harris & Elsner, 1997; Silverman & Casazza, 2000).
- Developing classroom based learning communities (McKeachie, 2002; McCabe & Day, 1998; Tinto, 1997).
- Integrating classrooms and instructional laboratories (Boylan & Saxon, 1998; Boylan, 2002; McCabe, 2000).
- Utilizing diverse methods of presenting instructional material (McCabe, 2000; Silverman & Casazza, 2000; McKeachie, 2002).

A recently discovered factor that also appears to contribute to the cognitive development during the college years is institutional diversity. Having the opportunity to interact with students from different ethnic backgrounds has a statistically significant positive impact on critical thinking scores among college students (Pascarella, Palmer, Moye, & Pierson, 2001). The opportunity to associate with peers of different cultural and ethnic backgrounds also contributes of enhanced intellectual self-esteem among college graduates (Chang, 1999).

A landmark study of 1,258 students at seven different universities revealed that the greater the ethnic diversity of the college classroom, the greater the cognitive gains among students in these classrooms (Terenzini, Cabrera, Colbeck, Bjorklund, & Parente, 2001). Students in classrooms with moderate to high levels of diversity made measurable gains in problem solving and group skills development while

students in low diversity classrooms gained less in these areas (Terenzini et al., 2001). Although not as strong as the influence of peers or faculty, attending classes with students of different ethnic groups does appear to have a positive influence on students' cognitive development.

SUMMARY AND CONCLUSION

This analysis of US college graduate attributes indicates that completing college does make a difference. As a result of attending college, US graduates increase their competence in all general academic skills and in specific subject-area skills. The amount of gain is strongest in writing and verbal skills and weakest in mathematics skills. Furthermore, the type of institution attended makes little difference in cognitive skill development in US students, particularly during the first two years of college. Men appear to gain more than women from college attendance, probably due to the dominant male orientation of American higher education.

In addition, students' affective characteristics are positively influenced by participation and graduation from college. US students gain in their self-confidence, social skills, autonomy, and other directedness during the college years. Graduating from college in the US contributes to more liberal social attitudes, particularly at smaller colleges and among women. College graduates in the US also gain a greater appreciation for and interest in lifelong learning as a result of their college experience.

The cognitive and affective growth of college graduates is influenced most by their peers followed by the influence of faculty. Faculty appear to have a greater influence on the development of the weakest students. Furthermore, because there is a relationship between the quality of teaching and the quality of learning, the influence exerted on students' cognitive development by faculty may be increased by improving the quality of instruction. Cognitive growth also appears to be positively influenced by the amount of diversity present in the college classroom.

It should also be noted that the cognitive and affective gains among US college graduates has not been negatively impacted by thirty years worth of efforts to extend educational opportunity. Many have argued that, as the opportunity to attend college was extended to a greater number and variety of students, the

quality of college graduates would decline. This has not been the case.

An analysis of General Intellectual Ability Test scores of college applicants from 1967 to 1990 indicates that there was, indeed, a decline in scores between 1967 and 1980 as more non-traditional and minority students entered college. However, although postsecondary participation among non-traditional and minority students continued to increase, the decline was reversed during the 1980s, and by 1989 the general intellectual abilities of college freshmen were comparable to those who entered college in 1966 (Bishop, 1989).

Furthermore, the intellectual skills of US college graduates have actually improved during this period. In a major US government study, Boesel & Fredland (1998) reported trends from twenty years of graduate entrance examination scores including the Graduate Record Examination (GRE), the Law School Admissions Test (LSAT), the Graduate Management Admissions Test (GMAT), and the Medical School Admissions Test (MCAT). They found that scores on these tests declined during the 1970s but rebounded during the 1980s. Scores of college graduates on measures of general intellectual ability now exceed the scores obtained by college graduates of the 1960s. In spite of the fact that more students than ever before are attending US colleges and universities and that these students are more diverse than ever before, the intellectual ability of US college graduates has actually improved during the past twenty years. It is, therefore, gratifying to report that postsecondary institutions in United States are generally successful in their goal of maintaining academic quality while expanding access to all the nation's citizens.

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