Employment of cost estimators in manufacturing should remain relatively stable as firms continue to use their services to identify and control their operating costs. Experienced estimators with degrees in engineering, science, mathematics, business administration, or economics should have the best job prospects in manufacturing.

**Earnings**

Salaries of cost estimators vary widely by experience, education, size of firm, and industry. Median annual earnings of cost estimators in 2000 were $45,800. The middle 50 percent earned between $35,040 and $59,410. The lowest 10 percent earned less than $27,710, and the highest 10 percent earned more than $75,460. Median annual earnings in the industries employing the largest numbers of cost estimators in 2000 were:

- Nonresidential building construction: $50,930
- Electrical work: $49,630
- Plumbing, heating, and air-conditioning: $47,680
- Residential building construction: $46,360
- Miscellaneous special trade contractors: $45,740

College graduates with degrees in fields that provide a strong background in cost estimating, such as engineering or construction management, could start at a higher level. According to a 2001 salary survey by the National Association of Colleges and Employers, bachelor’s degree candidates with degrees in construction science/management received job offers averaging about $40,740 a year.

**Related Occupations**

Other workers who quantitatively analyze information include accountants and auditors; budget analysts; claims adjusters, appraisers, examiners, and investigators; economists and market and survey researchers; financial analysts and personal financial advisors; insurance underwriters; loan counselors and officers; and operations research analysts. In addition, the duties of industrial production managers and construction managers also may involve analyzing costs.

**Sources of Additional Information**

Information about career opportunities, certification, educational programs, and cost-estimating techniques may be obtained from:

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### Education Administrators

(O*NET 11-9031.00, 11-9032.00, 11-9033.00, 11-9039.99)

**Significant Points**

- Most jobs require experience in a related occupation, such as teacher or admissions counselor, and a master’s or doctoral degree.
- Strong interpersonal and communication skills are essential, because so much of an administrator’s job involves working and collaborating with others.
- Job outlook is excellent, as a large proportion of education administrators are expected to retire over the next 10 years.

**Nature of the Work**

Smooth operation of an educational institution requires competent administrators. Education administrators provide direction, leadership, and day-to-day management of educational activities in schools, preschools and daycare centers, colleges and universities, businesses, correctional institutions, museums, and job training and community service organizations. (College presidents and school superintendents are covered in the *Handbook* statement on general managers and top executives.) Education administrators set educational standards and goals and establish the policies and procedures to carry them out. They also supervise managers, support staff, teachers, counselors, librarians, coaches, and others. They develop academic programs; monitor students’ educational progress; train and motivate teachers and other staff; manage guidance and other student services; administer recordkeeping; prepare budgets; handle relations with parents, prospective and current students, employers, and the community; and perform many other duties. In an organization such as a small daycare center, one administrator may handle all these functions. In universities or large school systems, responsibilities are divided among many administrators, each with a specific function.

Those who manage elementary and secondary schools are called principals. They set the academic tone and hire, evaluate, and help improve the skills of teachers and other staff. Principals confer with staff to advise, explain, or answer procedural questions. They visit classrooms, observe teaching methods, review instructional objectives, and examine learning materials. They actively work with teachers to develop and maintain high curriculum standards, develop mission statements, and set performance goals and objectives. Principals must use clear, objective guidelines for teacher appraisals, because pay often is based on performance ratings.

Principals also meet and interact with other administrators, students, parents, and representatives of community organizations. Decision-making authority has increasingly shifted from school district central offices to individual schools. Thus, parents, teachers, and other members of the community play an important role in setting school policies and goals. Principals must pay attention to the concerns of these groups when making administrative decisions.

Principals prepare budgets and reports on various subjects, including finances and attendance, and oversee the requisitioning and allocation of supplies. As school budgets become tighter, many principals are more involved in public relations and fundraising to secure financial support for their schools from local businesses and the community.

Principals must take an active role to ensure that students meet national academic standards. Many principals develop school/business partnerships and school-to-work transition programs for students. Increasingly, principals must be sensitive to the needs of the rising number of non-English speaking and culturally diverse students. Growing enrollments, which are leading to overcrowding at many existing schools, also are a cause for concern. When addressing problems of inadequate resources, administrators serve as advocates for the building of new schools or the repair of existing ones.

Schools continue to be involved with students’ emotional welfare as well as their academic achievement. As a result, principals face responsibilities outside the academic realm. For example, in response to the growing numbers of dual-income and single-parent families and teenage parents, schools have established before-and after-school child-care programs or family resource centers, which also may offer parenting classes and social service referrals. With the help of community organizations, some principals have...
established programs to combat increases in crime, drug and alcohol abuse, and sexually transmitted disease among students.

Assistant principals aid the principal in the overall administration of the school. Some assistant principals hold this position for several years to prepare for advancement to principal; others are career assistant principals. They are responsible for scheduling student classes, ordering textbooks and supplies, and coordinating transportation, custodial, cafeteria, and other support services. They usually handle discipline, attendance, social and recreational programs, and health and safety. They also may counsel students on personal, educational, or vocational matters. With site-based management, assistant principals play a greater role in developing curriculum, evaluating teachers, and dealing with school-community relations—responsibilities previously assumed solely by the principal. The number of assistant principals a school employs may vary depending on the number of students.

Administrators in school district central offices manage public schools under their jurisdiction. This group includes those who direct subject area programs such as English, music, vocational education, special education, and mathematics. They plan, evaluate, standardize, and improve curriculums and teaching techniques, and help teachers improve their skills and learn about new methods and materials. They oversee career counseling programs, and testing that measures students’ abilities and helps place them in appropriate classes. Central office administrators also include directors of programs such as guidance, school psychology, athletics, curriculum and instruction, and professional development. With site-based management, administrators have transferred primary responsibility for many of these programs to the principals, assistant principals, teachers, and other staff.

In colleges and universities, academic deans, deans of faculty, provosts, and university deans assist presidents, make faculty appointments, develop budgets, and establish academic policies and programs. They also direct and coordinate the activities of deans of individual colleges and chairpersons of academic departments. Fundraising also is becoming an essential part of their job.

College or university department heads or chairpersons are in charge of departments such as English, biological science, or mathematics. In addition to teaching, they coordinate schedules of classes and teaching assignments; propose budgets; recruit, interview, and hire applicants for teaching positions; evaluate faculty members; encourage faculty development; sit on committees; and perform other administrative duties. In overseeing their departments, chairpersons must consider and balance the concerns of faculty, administrators, and students.

Higher education administrators also direct and coordinate the provision of student services. Vice presidents of student affairs or student life, deans of students, and directors of student services may direct and coordinate admissions, foreign student services, health and counseling services, career services, financial aid, and housing and residential life, as well as social, recreational, and related programs. In small colleges, they may counsel students. In larger colleges and universities, separate administrators may handle each of these services. Registrars are custodians of students’ records. They register students, prepare student transcripts, evaluate academic records, assess and collect tuition and fees, plan and implement commencement, oversee the preparation of college catalogs and schedules of classes, and analyze enrollment and demographic statistics. Directors of admissions manage the process of recruiting, evaluating, and admitting students, and work closely with financial aid directors, who oversee scholarship, fellowship, and loan programs. Registrars and admissions officers must adapt to technological innovations in student information systems. For example, for those whose institutions present information—such as college catalogs and schedules—on the Internet, knowledge of on-line resources, imaging, and other computer skills is important. Athletic directors plan and direct intramural and intercollegiate athletic activities, seeing to publicity for athletic events, preparation of budgets, and supervision of coaches. Other increasingly important administrators direct fundraising, public relations, distance learning, and technology.

Working Conditions
Education administrators hold management positions with significant responsibility. Most find working with students extremely rewarding, but as the responsibilities of administrators have increased in recent years, so has the stress. Coordinating and interacting with faculty, parents, and students can be fast-paced and stimulating, but also stressful. Principals and assistant principals, whose main duty often is discipline, may find working with difficult students challenging and frustrating. And as the number of school-age children rises in some States, having to deal with overcrowding and the lack of teachers has become a major issue in many jurisdictions.

Many education administrators work more than 40 hours a week, including some nights and weekends during which they oversee school activities. Most administrators work 10 or 11 months a year, but some work year round. Some jobs include travel.
Employment
Education administrators held about 453,000 jobs in 2000. About 9 out of 10 were in educational services, which includes elementary, secondary, and technical schools, and colleges and universities. The rest worked in child daycare centers, religious organizations, job training centers, State departments of education, and businesses and other organizations that provided training for their employees.

Training, Other Qualifications, and Advancement
Most education administrators begin their careers in related occupations, and prepare for a job in education administration by completing a master’s or doctoral degree. Because of the diversity of duties and levels of responsibility, their educational backgrounds and experience vary considerably. Preschool directors, principals, assistant principals, central office administrators, and academic deans usually have held teaching positions before moving into administration. Some teachers move directly into principal positions; others first become assistant principals, or gain experience in other central office administrative jobs at either the school or district level in positions such as department head, curriculum specialist, or subject matter advisor. In some cases, administrators move up from related staff jobs such as recruiter, guidance counselor, librarian, residence hall director, or financial aid or admissions counselor.

To be considered for education administrator positions, workers must first prove themselves in their current jobs. In evaluating candidates, supervisors look for determination, confidence, innovativeness, motivation, and leadership. The ability to make sound decisions and to organize and coordinate work efficiently is essential. Because much of an administrator’s job involves interacting with others—such as students, parents, and teachers—a person in such a position must have strong interpersonal skills and be an effective communicator and motivator. Knowledge of management principles and practices, gained through work experience and formal education, is important. A familiarity with computer technology is a plus for principals, who are becoming increasingly involved in gathering information and coordinating technical resources for their students and classrooms.

In most public schools, principals, assistant principals, and school administrators in central offices need a master’s degree in education administration or educational supervision. Some principals and central office administrators have a doctorate or specialized degree in education administration. In private schools, which are not subject to State certification requirements, some principals and assistant principals hold only a bachelor’s degree; however, the majority have a master’s or doctoral degree. Most States require principals to be licensed as school administrators. License requirements vary by State. National standards for school leaders, including principals and supervisors, were recently developed by the Interstate School Leaders Licensure Consortium. Several States currently use these national standards as guidelines to assess beginning principals for licensure, and many more States are expected to adopt the standards for this purpose. Some States require administrators to take continuing education courses to keep their certification, thus ensuring that administrators have the most up-to-date skills.

The number and types of courses required to maintain certification vary by State. Academic deans and chairpersons usually have a doctorate in their specialty. Most have held a professorship in their department before advancing. Admissions, student affairs, and financial aid directors and registrars sometimes start in related staff jobs with bachelor’s degrees—any field usually is acceptable—and obtain advanced degrees in college student affairs, counseling, or higher education administration. A Ph.D. or Ed.D. usually is necessary for top student affairs positions. Computer literacy and a background in mathematics or statistics may be assets in admissions, records, and financial work.

Advanced degrees in higher education administration, educational supervision, and college student affairs are offered in many colleges and universities. The National Council for Accreditation of Teacher Education accredits these programs. Education administration degree programs include courses in school management, school law, school finance and budgeting, curriculum development and evaluation, research design and data analysis, community relations, politics in education, counseling, and leadership. Educational supervision degree programs include courses in supervision of instruction and curriculum, human relations, curriculum development, research, and advanced pedagogy courses.

Education administrators advance by moving up an administrative ladder or transferring to larger schools or systems. They also may become superintendents of school systems or presidents of educational institutions.

Job Outlook
Employment of education administrators is projected to grow about as fast as the average for all occupations through 2010. However, job opportunities will be excellent, as a large proportion of education administrators are expected to retire over the next 10 years. Also, as education and training take on greater importance in everyone’s lives, the need for people to administer education programs will grow.

Enrollments of school age children have a major impact on the demand for education administrators. The Department of Education projects enrollment of preschool, elementary, and middle school students to be stable over the next 10 years. If mandatory preschool becomes more widespread, however, more preschool directors will be needed. The numbers of secondary and postsecondary school students are projected to grow more rapidly, creating more demand for administrators at these levels. In addition, enrollments are expected to increase the fastest in the West and South, where the population is growing, and to decline or remain stable in the Northeast and the Midwest. School administrators also are in greater demand in rural and urban areas, where pay is generally lower than in the suburbs.

Principals and assistant principals should have the best job prospects. A sharp increase in responsibilities in recent years has made the job more stressful, and has discouraged teachers from taking positions in administration. Principals are now being held more accountable for the performance of students and teachers, while at the same time they are required to adhere to a growing number of government regulations. In addition, overcrowded classrooms, safety issues, and the teacher shortage all are creating additional pressures on principals and assistant principals. The increase in pay is often not high enough to entice people into the field.

Job prospects also are favorable for college and university administrators, particularly those seeking nonacademic positions. While competition for positions as academic deans and department heads remains keen, as faculty strive for these prestigious jobs, there is a shortage of applicants for nonacademic administrative jobs. For example, positions as directors of admissions or student affairs are difficult to fill. Furthermore, the requirement for a master’s or doctoral degree in education administration discourages many people—who can earn higher salaries elsewhere—from entering the profession.

Colleges and universities are also adding administrators to handle an increasing number of tasks. Directors of technology and distance learning are being added to handle these functions. The need
to keep tuition costs down is also creating a growing need for directors of fundraising (also called development) and for public relations officials, whose mission is to boost community support and raise money.

Earnings
Salaries of education administrators depend on several factors, including the location and enrollment level in the school or school district. According to a survey of public schools, conducted by the Educational Research Service, average salaries for principals and assistant principals in the 1999-2000 school year were as follows:

<table>
<thead>
<tr>
<th>Position</th>
<th>Salary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directors, managers, coordinators, and supervisors</td>
<td>$73,499</td>
</tr>
<tr>
<td>Principals:</td>
<td></td>
</tr>
<tr>
<td>Elementary school</td>
<td>$69,407</td>
</tr>
<tr>
<td>Jr. high/middle school</td>
<td>$73,877</td>
</tr>
<tr>
<td>Senior high school</td>
<td>$79,839</td>
</tr>
<tr>
<td>Assistant principals:</td>
<td></td>
</tr>
<tr>
<td>Elementary school</td>
<td>$56,419</td>
</tr>
<tr>
<td>Jr. high/middle school</td>
<td>$60,842</td>
</tr>
<tr>
<td>Senior high school</td>
<td>$64,811</td>
</tr>
</tbody>
</table>

In 2000-01, according to the College and University Professional Association for Human Resources, median annual salaries for selected administrators in higher education were as follows:

<table>
<thead>
<tr>
<th>Administrative Level</th>
<th>Salary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic deans:</td>
<td></td>
</tr>
<tr>
<td>Medicine</td>
<td>$272,200</td>
</tr>
<tr>
<td>Law</td>
<td>180,150</td>
</tr>
<tr>
<td>Engineering</td>
<td>146,938</td>
</tr>
<tr>
<td>Business</td>
<td>101,082</td>
</tr>
<tr>
<td>Education</td>
<td>96,906</td>
</tr>
<tr>
<td>Arts and sciences</td>
<td>94,666</td>
</tr>
<tr>
<td>Social sciences</td>
<td>72,877</td>
</tr>
<tr>
<td>Mathematics</td>
<td>69,449</td>
</tr>
<tr>
<td>Other administrators:</td>
<td></td>
</tr>
<tr>
<td>Dean, students</td>
<td>$67,000</td>
</tr>
<tr>
<td>Director, admissions and registrar</td>
<td>58,241</td>
</tr>
<tr>
<td>Director, annual giving</td>
<td>46,800</td>
</tr>
<tr>
<td>Director, student activities</td>
<td>39,292</td>
</tr>
</tbody>
</table>

Benefits for education administrators are generally very good. Many get 4 or 5 weeks vacation every year and have generous health and pension packages. Many colleges and universities offer free tuition to employees’ children.

Related Occupations
Education administrators apply organizational and leadership skills to provide services to individuals. Workers in related occupations include administrative services managers; office and administrative support worker supervisors and managers; human resource, training, and labor relations managers and specialists; and archivists, curators, and museum technicians. Education administrators also work with students and have backgrounds similar to those of counselors; librarians; instructional coordinators; teachers— preschool, kindergarten, elementary, middle, and secondary; and teachers—postsecondary.

Sources of Additional Information
For information on elementary school principals, contact:


For information on collegiate registrars and admissions officers, contact:


For information on professional development and graduate programs for college student affairs administrators, contact:


Engineering and Natural Sciences Managers

Significant Points

- Most engineering and natural sciences managers have previous experience as engineers, scientists, or mathematicians.
- Employers prefer managers with advanced technical knowledge and strong communication and administrative skills.

Nature of the Work
Engineering and natural sciences managers plan, coordinate, and direct research, design, and production activities. They may supervise engineers, scientists, and technicians, along with support personnel. These managers use advanced technical knowledge of engineering and science to oversee a variety of activities. They determine scientific and technical goals within broad outlines provided by top executives, who are discussed elsewhere in the Handbook. These goals may include improving manufacturing processes, advancing scientific research, or redesigning aircraft. Managers make detailed plans to accomplish these goals—for example, they may develop the overall concepts of a new product or identify technical problems preventing the completion of a project.

To perform effectively, they also must possess knowledge of administrative procedures, such as budgeting, hiring, and supervision. These managers propose budgets for projects and programs and determine staff, training, and equipment purchases. They hire and assign scientists, engineers, and support personnel to carry out specific parts of each project. They also supervise the work of these employees, review their output, and establish administrative procedures and policies—including environmental standards, for example.

In addition, these managers use communication skills extensively. They spend a great deal of time coordinating the activities of their unit with those of other units or organizations. They confer with higher levels of management; with financial, production, marketing, and other managers; and with contractors and equipment and materials suppliers.

Engineering managers supervise people who design and develop machinery, products, systems, and processes; or direct and coordinate production, operations, quality assurance, testing, or maintenance in industrial plants. Many are plant engineers, who direct and coordinate the design, installation, operation, and maintenance of equipment and machinery in industrial plants. Others manage research and development teams that produce new products and processes or improve existing ones.

Natural sciences managers oversee the work of life and physical scientists, including agricultural scientists, chemists, biologists, geologists, medical scientists, and physicists. These managers direct research and development projects and coordinate activities such as testing, quality control, and production. They may work on basic research projects or on commercial activities. Science managers sometimes conduct their own research in addition to managing the work of others.