

**Efforts by Federal Agencies to Develop  
Occupational Curriculum for Entry-Level Workers**

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## **I. Introduction**

One of the continual challenges facing secondary and postsecondary vocational educators today is the development of relevant curriculum for their programs. This is especially true in many of the newly-emerging occupational areas of information and computer technology. The ability to offer up-to-date curriculum becomes a critical component for determining the success of these programs at winning employment for the students.

However, the curriculum challenge is not simply concentrated on the task of keeping up with changes in technology. With the growing recognition that vocational education should prepare students not just for entry-level work, but for career pathways, it is important to develop courses and programs that enable students to understand how the technology is used within the particular occupational context. Computer applications are found in almost all occupations, but even similar computer devices are used very differently. For example, knowledge of a Geographic Positioning System (GPS) as used by civil engineers making technical changes in the design of a highway is very different than the use of GPS by farmers in determining precision agriculture production. In both cases, preparation of a student involves not only mastery of the technology, but also knowledge of how it might be used in specific occupations.

If being both “technically up-to-date” and providing “context” for particular career pathways matter, where do vocational administrators turn for the expertise? Certainly good instructors ultimately base the curriculum upon the specific needs of the industry or employers. However, at the secondary level, it is difficult at best for vocational instructors and administrators to cultivate these ties. In many cases the instructors themselves are unfamiliar with the new or emerging technology and the specific context in which it is used.

The federal government has attempted to respond to the need for relevant occupational curriculum in a number of ways. The work of the National Skill Standards Board (NSSB) has been to develop and disseminate industry -based skill standards. While these standards are not curriculum, they provide a road map on which to construct curriculum. The Office of Vocational and Adult Education (OVAE) provided initial support for state vocational education agencies to jointly develop curriculum focused around career clusters.

However, there may be other federal sources for vocational curriculum. Many of the major agencies of the federal government are in need of specialized skills, often similar to skills needs in the private sector, and some introduce specialized training programs for these occupations. In addition through carrying out their legislative mission, the agencies interact with the private economic sector and are often knowledgeable about the current and future workforce demands within a key occupational area. For example, it is logical that the Federal Aviation Agency would assume the task of delineating the skills of

airport security staff, and perhaps would even develop the curriculum that could train staff to achieve proficiency in performing these tasks. The Department of Defense, a large employer with a workforce engaged in diverse tasks, may find it worthwhile to develop curriculum and course programs to train staff – programs that would have applications outside of the armed services.

The purpose of this brief paper is to review the sources of vocational curriculum – instruction that provides the skills necessary for individuals to perform entry-level jobs at the sub-baccalaureate level – that may be available from selected federal agencies other than OVAE.<sup>1</sup> The research method relied on an investigation of the Web sites of specific agencies. The paper outlines the relevant content of these sites, as well as some challenges policymakers and practitioners may face in accessing the available curricula.

## **II. Methods**

To perform this research, the Web sites of six major federal government agencies were examined: four were Cabinet-level agencies, one was a stand-alone agency and one was a cluster of research institutions within a Cabinet-level federal agency. They include:

- Department of Agriculture
- Department of Commerce
- Department of Defense
- Department of Energy
- National Science Foundation
- National Institutes of Health

These agencies were selected with the expectation that the scope of their activity would include many occupations that are relevant to vocational education, for example, farming, manufacturing, and engineering.

The process for identifying relevant curriculum was initially performed through a computer search of the Web sites of the agencies and their various units. The headings used in the search process were consistent: vocational curriculum, occupational curriculum and educational curriculum. In each agency, any program involving secondary or postsecondary education was examined to determine if there was suitable curriculum at the site. In addition, grant programs and other resources also were examined to determine if there was relevant material. When a promising area was found, phone calls were made to the agency to ask more specific questions about the program and the available curricula.

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<sup>1</sup> The federal legislation that supports vocational education, the Carl D. Perkins Vocational and Technical Education Act of 1998, defines vocational education as preparing students for occupations that require less than a baccalaureate degree.

In examining the extent of occupational or vocational curriculum found, three other assumptions were made in the search procedures:

1. *Curriculum or educational programs that produced curriculum for occupations that typically require a four-year or advanced degrees were eliminated from the search.* For example, programs in the Department of Energy (DOE), the National Science Foundation (NSF) and the National Institutes of Health (NIH) that help prepare engineers, scientists and physicians were not reviewed unless they could be adapted to other non-professional, sub-baccalaureate jobs, such as nursing or engineering technology. In comparison to the curriculum we found relevant to traditional vocational education occupations, products geared toward higher-degree occupations were far more extensive, perhaps reflecting the national policy of promoting advanced degrees in science and technology as critical to the national interest.
2. *Teacher professional development curriculums also were eliminated from the search.* For example, there are many programs within NIH that aid in the training of teachers in medical fields or at NSF that are applicable to math, science and technology teachers. Excluding teacher training curricula reflects our priority on finding curricula that vocational educators could use to instruct students rather than improve their own teaching skills.
3. *Internal curriculum or course programs directed at agency staff were not considered.* Most agencies run extensive internal education activities for their staff. This is curriculum intended to train workers at their agencies, not through educational institutions. For example, the DOE maintains a Federal Energy Management Program that trains federal employees from other governmental agencies in basic energy conservation and construction technologies. There is a Federal Training Mall, listing training opportunities across federal agencies, that is maintained by the National Technical Information Service of the Technology Administration within the Department of Commerce. An examination of the specifics of these programs was beyond the scope of the present study, but it appears many of these programs include curriculum that could be fashioned into a “dual use” – agency and civilian – curriculum strategy.

### **III. Occupational Curricula Available Through Federal Agencies**

What follows is a review of selected departments’ curriculum offerings, with a brief discussion of the promising programs. The most useful Web sites are listed in Table 1 at the end of the paper. In addition, at the end of the paper there is a general discussion of the characteristics of the programs, and some suggestions are made for the development of a relationship between the Office of Adult and Vocational Education and the agencies of the federal government.

#### **A. Department of Agriculture (DOA)**

This department has enjoyed a particularly extensive relationship with higher education institutions in the form of partnerships with land grant colleges. In addition, there has

been extensive interaction between the department and specific non-governmental organizations such as the 4-H Clubs and Future Farmers of America (FFA); this interaction has developed substantial curriculum and programs targeted at young people interested in agricultural occupations. Most of these however were not occupationally specific, but more designed to inform high school students and younger of the career opportunities within agriculture. DOA's library will eventually house all curricula developed through the funded projects and extension centers, with a goal to establish an interactive data site for all inquires regarding DOA curriculum and products. Some specific curricula already available include:

1. *Agriculture*: DOA has several programs that are potential sources of curricula. The Workforce Preparation Initiative will “marshal the extension, teaching and resources of the land-grant university system to address workforce preparation” with a focus on agricultural occupations [Contact: Jim Terry, (202) 690-1227, [www@reeusda.gov](mailto:www@reeusda.gov)]. Second, the Higher Education Programs, under the Cooperative State Research, Education and Extension Service (CSREES), administers programs to enhance the quality of food and agricultural sciences education in higher education institutions including community colleges. Some curricula developed with the service's support are already being used by some community college vocational programs, such as agricultural technology instrumentation. According to staff of the unit, the curricula developed by these grants will be found at the Library of the U.S. Department of Agriculture (Contact: Higher Education Programs: <http://www.reeusda.gov/serd/hep/hep.htm>).
2. *Forestry*: The Forestry Research and Extension service is supported by the CSREES, which works with land grant colleges and “qualifying forestry schools.” Curriculum has been developed in logger training and education, master woodland manager, and forestry management and includes a Forestry CD-ROM developed by an outside contractor for DOA Contact: Larry Biles, (202) 401-4926, [www@reeusda.gov](mailto:www@reeusda.gov)).
3. *Food Sciences*: The National Integrated Food Safety Initiative, a component of the Integrated Research, Reeducation and Extension Competitive Grants Program (IREECGP), has developed curriculum for and funds food handler certification training ([www@fsis.usda/oa/consedu.html](http://www@fsis.usda/oa/consedu.html)).

## **B. Department of Commerce (DOC)**

This department houses the Office of Technology Policy Unit. This is the “only office in the federal government with the explicit mission of developing and advocating national policies and initiatives that use technology to build America's strength”([www.doc.gov](http://www.doc.gov)).

1. *Marine Education*: DOC's National Oceanic and Atmospheric Administration supports a Consortium of Ocean Research and Education, which maintains a database of K-12 curriculum in marine education, some of which was developed

jointly with NSF. The unit also sponsors the New Millennium Observatory (NeMO) program, which produces other marine curricula for K-12 students ([www.oaa.doc.gov](http://www.oaa.doc.gov)).

2. *Manufacturing Technology:* DOC includes three different programs that produce or support occupational curricula relevant to manufacturing. First, the National Institute of Standards and Technology (NIST) has a Manufacturing Extension Partnership (MEP), a network of extension centers and experts offering technical and business assistance to small- and medium-sized manufacturers. The centers have developed a variety of curricula, including courses on Total Quality Management, an introduction to ISO 9000 and courses in specific manufacturing technologies ([www.mepcenters.nist.gov/net101](http://www.mepcenters.nist.gov/net101)). Second, also in NIST, the Advanced Technology Program (ATP) funds industry partners to develop high-risk enabling technologies and some of these projects have produced curricula to train workers in advanced manufacturing technologies ([www.atp.nist.gov/](http://www.atp.nist.gov/)). Third, several programs under the laboratory research unit of NIST focus on specific technologies – for example, the Technical Vision Systems for U.S. Fiber/Textile Apparel Industry – that could provide the basis for manufacturing programs directed at incumbent workers ([www.nist.gov](http://www.nist.gov)).
3. *Other Technical Curricula:* The National Technical Information Services (NTIS) under NIST is designed “to distribute government technical, scientific and business-related information,” and part of this mandate appears to be the compilation of technical and vocational curricula, primarily for adults. NTIS develop CD-ROM products for other federal agencies ([www.ntis.gov/](http://www.ntis.gov/)).

### **C. Department of Defense (DOD)**

DOD has developed the most detailed and comprehensive sets of training curricula of any federal department or agency. Not only are many curricula accessible to civilians, but there also has been an attempt to standardize the methodology and description of the training in ways that make it easy to compare military occupational titles with civilian ones. There are some drawbacks with accessing these sites, however. Many require military clearance and the procedures for civilian use are not yet in place. Also, it is difficult to obtain permission to search through some specific areas of DOD to obtain the curricula.

The U.S. Army Web site, <http://www.armyeducation.army.mil>, is an extremely well-designed and easy to use system for finding training materials. It contains curricula for a wide variety of positions in the Army and was designed to coordinate with the Department of Labor’s ONET database. Through the Credentialing Opportunities On-Line (COOL) system it is possible to click on a military occupation and find: civilian credentials related to a military occupational specialty, the steps necessary to obtain these credentials and detailed training curricula for each of the occupations. Moreover, unlike others, the Army site specifically encourages civilian use – “This site is an important new

resource not only for soldiers, but also for career counselors, recruiters, employers and credentialing organizations.”

The Air Force appears to provide the widest access to curricula through its Web site, <http://www.e-publishing.af.mil/pubs/publist.asp?puborg=AF&series=36>. After reaching that site, scroll down to AFMAN 36-2108. This document contains a list of all the occupations in which the Air Force has provided curriculum. Each is divided into levels of management starting from helper, apprenticeship, journeyman through superintendent, and manager. We provide here only a small sample of all the occupations for which the military services have developed curriculum products.

1. *Communications and Electronics*: The curriculum is very detailed, including tests and other instructional documents that can be downloaded from the Air Force Web site. While many of the Air Force occupational programs focus on specific functions for the repair and maintenance of air force equipment, they are readily adoptable to civilian repair and maintenance functions beyond the military.
2. *Aircraft Machine Maintenance*: Specific military bases also make training available in specific subjects. For example, the 81<sup>st</sup> Training Wing at Keesler Air Force Base, Miss., offers many aircraft and machine maintenance programs that are similar to the tasks of civilian airlines mechanics ([http://wwwmil.keesler.af.mil/menu/index\\_1.htm](http://wwwmil.keesler.af.mil/menu/index_1.htm)).
3. There are also many other occupations that fit traditional white-collar environments such as logistics planning, traffic management, information management, computer systems operations, medical support, paralegal, dental assistant and financial manager.

#### **D. Department of Energy (DOE)**

This department is responsible for most of the federal government’s energy programs including technology programs that deal with specific forms of energy. In addition, this department is responsible for the design, construction and testing of nuclear weapons. The department is not only very active in the promotion of instructional materials for energy-related industries, but also for other occupations that require scientific and technology skills. For example, DOE supports a number of curriculum development programs at their national laboratories.

1. *Energy Occupations*: DOE maintains the Energy Efficiency and Renewable Energy Clearinghouse (EREC), which collects curriculum for occupations related to the production and distribution of energy, such as wind power mechanical and electrical technicians – “windsmiths” – who are required to operate and maintain wind turbines. The clearinghouse distributes a CD-ROM called “Get Smart About Energy” that contains lesson material relating to energy occupations ([www.eren.doe.gov/consumerinfo/](http://www.eren.doe.gov/consumerinfo/)). The Office of Nuclear Energy, Science and Technology also offers curricula for nuclear energy occupations (<http://nuclear.gov/>).



2. *Networking Technology*: Los Alamos Laboratory provides curricula for training in several technical occupations, including networking technology. It produces a curriculum called *Model Networks Guide* (<http://education.lanl.gov/EPO/>).

## **E. National Science Foundation(NSF)**

The National Science Foundation is a separate federal agency established in 1950 to support education and research in all scientific and engineering disciplines. The budget of the agency is more than \$4 billion, about 3.8 percent of all federal spending on research and development. Most of the foundation's activities are performed under contract to educational institutions and other vendors. There are more than 2,000 educational institutions from K-12 to postgraduate programs currently working on NSF contracted projects. The agency awards about 19,000 projects each year.

Since the early 1950s, the agency has supported K-12 science and math improvement efforts. But only more recently has the agency been involved in programs that develop curricula relevant to vocational educators, particularly around technology and its applications. These programs have produced materials in several areas.

1. *Technical and Engineering Occupations (secondary-level curricula)*: In particular, the NSF program "Transitions from Childhood to the Workforce" encourages researchers and curriculum developers to adapt their efforts to applications in the labor market; for example, one project is called Cross Training Technicians and Engineers for Semi-Conduction Manufacturing ([www.nsf.gov/sbe/tcw/start.htm](http://www.nsf.gov/sbe/tcw/start.htm)). Many of the projects funded under this program may have curricula relevant to vocational educators.
2. *Technician and Engineering Occupations (sub-baccalaureate)*: The Advanced Technological Education Program (ATE) supports curriculum development and preparation and professional development of faculty, with a particular focus on two-year colleges and the education of technicians for high-technology fields. The ATE's program supports nine major centers located at specific community colleges, with each responsible for the development of curriculum. For example, Sinclair Community College developed an introduction to manufacturing set of instructional modules. The Maricopa Community College District center concentrated on the development of curriculum in chip-making processes. A third center, located at Bellevue Community College in Washington has developed standards and a curriculum for the informational technology industry. Another center, the Texas College of the Mainland in collaboration with the Gulf Coast Technology Alliance, is leading the development of a competency-based curriculum leading to a portable national credential for process technicians. All centers are expected to develop curriculum products that can be marketed to other community colleges and interested parties (<http://www.nsf.gov/search97cgi/vtopic.html>).

## **F. National Institutes of Health (NIH)**

The National Institutes of Health, part of the U.S. Department of Health and Human Services, is composed of 27 separate institutes and centers. The NIH mission is to uncover new knowledge that will lead to better health for everyone. NIH works toward that mission by conducting research in its own laboratories; supporting the research of non-federal scientists in universities, medical schools, hospitals and research institutions throughout the country and abroad; helping in the training of research investigators; and fostering communication of medical and health sciences information.

While all are primarily involved with basic scientific research and are focused upon issues for medical scientific advancement, almost all of the institutes have outreach programs for young people. Many concentrate on the recruitment of minority youth to science. However, each institute has programs that develop curriculum of potential use by vocational educators.

1. *Medical Careers*: The National Institute of General Medical Sciences has a science education unit that produces curricula, such as genetic research, relevant to a variety of medical occupations ([www.Pub\\_info@nigms.nih.gov](mailto:www.Pub_info@nigms.nih.gov)).
2. *Environmental Health Careers*: In terms of curriculum development, the most important program appears to be found within the National Institute of Environmental Health Sciences (NIEHS). The NIEHS Community Outreach and Educational Program has established educational centers whose mission includes the development and dissemination of environmental health curricula. For example, the Environmental Health Science Center at the University of Iowa has developed an Institute for Rural Youth, which maintains curricula that increase awareness of occupational hazards in agriculture. The Center at Oregon State has developed curricula that integrate mathematics, science and environmental technology. Access to these specific projects is available through the local web sites maintained by each center ([www.niehs.nih.gov/centers/overview/purpose.html](http://www.niehs.nih.gov/centers/overview/purpose.html)).

### III. Conclusions

With the exception of the military education sites, the majority of federal curriculum development activity occurs as a “by-product” of the agency’s main mission. Sometimes agencies have been forced to develop educational programs, if for no other reason than to generate public interest in their activities. The result of these more ad-hoc educational activities is not normally “off the shelf” curriculum that is easily used by vocational educators. There are several barriers to greater use by those not directly involved in the development.

First, the curricula developed are often uneven in scope and focus. For example, there are extensive curricula related to marine education put together by the National Oceanic and Atmospheric Administration, a unit of the Department of Commerce. Yet, there are few curricula developed for trade and technical assistance, another DOC responsibility. Similarly, in the DOE, the main concentration of curriculum is in the areas of renewal

energy, but there is little relating to the traditional fossil fuels of coal and oil. The unevenness and unfocused nature of the work makes it incumbent that these curricula be reviewed carefully before distribution to vocational educators.

Second, much of the curriculum has been developed as the result of a specifically funded project or program. After the project has been completed and submitted to the agency, unless there are specific plans for dissemination, the curriculum remains within the final report. Few agencies maintain Web sites with the Future Farmers of America or 4-H Clubs, where curricula can be downloaded in an educational format. Only with the advent of large electronic databases, which can easily search through thousands of project records, can such curricula now be found easily. In all four major federal agencies examined, steps were being taken to ensure that all project records could be retrieved electronically from agency libraries or database centers.

Third, an important question underlying this research is what do we mean by curriculum? Many of the products available appear to be course outlines, sometimes with stated objectives, reading lists and other components traditionally considered parts of curriculum. Others are more elaborate CD-ROMs with very rich textual detail, problems to be solved, a student manual and a variety of other pieces of information. The vast differences among the materials available make it likely that much will need to be reworked in order to be useful to vocational educators.

Fourth, there are wide differences in the words used by each agency to describe the occupations and careers. In most cases, the specific occupational codes and career cluster strategies promoted by vocational educators and the U.S. Department of Education may not conform to the occupations described by the agencies. For example, the Department of Energy has curriculum to cover career clusters in each specific renewal technology – solar, wind and geothermal. The Department of Commerce has curriculum for occupations associated with the marine industries. It is doubtful that most vocational educators, particularly at the secondary level, would want programs of such specificity. On the other hand, vocational educators could adapt and align their curriculum using part of what has already been developed by these agencies.

Another potential barrier is the motivation for the curriculum developed. Curricula developed by most agencies are intended to encourage interest in a specific occupational area or subject matter. Whether the curriculum is broad enough to treat all aspects of the subject may be questioned. For example, the curriculum of the Manufacturing Extension Partnership program in the Department of Commerce is directed only to small and medium firms – would this curriculum be general enough to be used in programs where students may work in larger manufacturing establishments? Similarly, the 4-H programs assume a specific knowledge of agricultural production that may not be found in some rural areas of the United States. Again, the issue may be how well vocational instructors are able to extract the relevant parts and blend them with other curricula components to meet their overall needs.

Finally, with the exception of the Advanced Technological Education centers, in most other agencies, there was not a process in place to systematically review developed curricula and to update them on a regular basis. In many projects, the curriculum was created and then disseminated “as is.” This suggests that one role for the Office of Vocational and Adult Education may be to aid these agencies in not only selecting a focus for curriculum development, but also a process for regularly updating and distributing those updates through the vocational education system.

#### **A. Policy Suggestions for the Office of Vocational and Adult Education (OVAE)**

This initial investigation indicates there is a potential for obtaining useful curricula for vocational educators from other federal agencies. However, doing so is far from automatic – indeed, OVAE may be interested in considering the following steps to make the process more transparent and viable for vocational educators.

- 1. OVAE could develop relationships directly with the units of federal agencies that appear to be likely repositories for curriculum and curriculum-related products. This would be especially useful for the material contained in the Department of Defense sites.*

It would be useful for OVAE to have direct liaison with organizations such as the Library at the Department of Agriculture or the National Science Foundation’s Advanced Technological Education program. Not only will it sensitize the other federal agencies’ repositories about the possibilities of curriculum dissemination of their work, but also through these direct ties, OVAE may be able to stimulate more curriculum development by indicating the “gaps” that might be filled. In phone conversations with various departments and units, there appeared to be a willingness to have the material used by OVAE. Thus, a more systematic relationship may be possible.

- 2. OVAE staff could become familiar with the missions, operating units and products of the federal agencies from other departments that are involved in the knowledge creation process. It may be useful for OVAE staff to hold an annual briefing for key personnel from these agencies, outlining specific curriculum needs faced by vocational educators.*

Many units within NIH and NSF are involved in increasing basic research into science, technology and health-related areas in order to increase knowledge. Curriculum development is a by-product of this process. The purpose of the direct ties between OVAE and the agencies would be to increase the likelihood that curriculum development in particularly relevant areas would become a more conscious part of the dissemination of their research. OVAE could choose these relationships carefully based on priorities for occupations that could benefit vocational education programs. Through this process, OVAE may become another “customer” of the other agencies’ research activity, potentially resulting in more beneficial products being developed. For example, in the case of the National

Institute of Nursing Research – an NIH center – an interest expressed by OVAE may stimulate that agency to develop more curricula and course modules targeted to the production of associate degree of nursing students, as opposed to the present focus almost exclusively on advanced nursing degrees. As an additional specific activity, OVAE may be able to work with some of the military Webmasters so that portions of these sites may be open for civilian use. The “dual use” possibilities for the military training and education programs appear to have significant potential.

- 3. OVAE could encourage its grant recipients to search through other federal agencies' materials and make good curriculum available to vocational education through linkages between the National Dissemination Center for Vocational Education and other traditional sources of curriculum for vocational education.*

In the development of its own grants programs, OVAE could begin encouraging its contractors to use this federal resource as a pre-condition of OVAE grant awards. For competition projects, points could be awarded for research proposals that attempt to adapt and use curriculum from these other agencies. Some of these developments are already happening between the ATE programs and other parts of the Department of Education. These could be examined and improved upon by OVAE. The National Center for Research in Vocational Education might be asked to develop courses and programs that identify the current repositories of information.

- 4. OVAE could develop a professional development module to be used by state directors of vocational education to adapt curricula available from other federal agencies.*

In large measure, the development of curriculum is essentially a state or more likely local activity. Through the Carl D. Perkins Vocational and Technical Education Act of 1998, states are able to use grant funds for curriculum development and other activities. OVAE could encourage local leadership to use state-developed sources of curriculum. In order to undertake this task, some form of staff development materials could be produced by OVAE and distributed to state and local vocational educators.

## **B. Final Thoughts**

While this paper was motivated by a very practical desire to more efficiently use governmental resources, there is an important theoretical and policy assumption that is related to this work. If the United States is becoming a “knowledge society,” then how knowledge is produced and disseminated matters more than in the past. It will be those societies that are able to manage the development, supply and implementation of new knowledge that will have a competitive edge. Viewed from this perspective, vocational education is a component of the knowledge creation process – playing the important role of imparting knowledge gained to young people. As a result, it is not simply practical good sense to develop ties between the federal agencies engaged in vocational education curriculum; it also serves to fashion a federal system of knowledge creation and dissemination.

