Creating Secondary Industry-Driven Technology Curriculum

Career Pathway Curriculum Development
for High School and Community College Educators

www.maritime-technology.org
Curriculum Development

This material is based upon work supported by the National Science Foundation under Grant No. DUE-1003068. Any opinions, findings, conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.
Today’s technical jobs are highly STEM-oriented. Industry employers are eager for education partners to produce a greater number of students with advanced technological skills resulting in academic and industry credentials to fill key technician-level positions. The work to create these technology-based education pathways is happening at all levels from secondary to post-secondary institutions. A large majority of the work in technician education is happening at a community college level, with a focus on training and certification. With so many career and education options available to students though, it is imperative to introduce technical education pathways as early as possible.

One successful technique being employed by many community colleges is partnering with local secondary schools to create industry-specific education programs. These programs introduce students to the career options available within an industry as well as giving them the basic technical knowledge they need to start an entry level position or continue their training with a community college. Basic certifications can also be embedded into high school programs to give students additional qualifications when entering the workforce.

Different approaches can be taken to create an industry-driven technical education program at a secondary school. Summer programs can be developed to introduce basic concepts and careers while students are not dividing their attention between multiple subjects and courses. Pre-Apprenticeship programs allow students to learn a specific skill in high school while increasing their likelihood of being selected to enter a lucrative apprenticeship program upon graduation. Dual enrollment programs permit students to get both high school and college credit for a single
course without secondary schools having to create new technical curriculum. One of the most valuable methods, for both students and industry, though is for secondary institutions to create a program of study or technology academy to meet the needs of an industry.

While the process of creating new curriculum may not be quick, the benefits to students, educators and industry make it worth the effort involved. Curriculum is a design plan for learning that requires the purposeful and proactive organization, sequencing and management of the interactions among the teacher, the students and the standards we want students to acquire (Mishra, 2011). There are standard series of steps that can be utilized to create any type of curriculum needed.
The Curriculum Development Process

Step 1: Determine Needs

This step is part of the planning process and the most important key to creating an effective curriculum. Curriculum committees are created to work on this process. The most successful committees for creating technical education curriculum are made from a combination of educators and industry partners. To make programs relevant to the needs of the industry in your area, leaders from local businesses need to be involved when developing these programs. While one area might be desperate for trained welders, another may need pipefitters more. Even within a specific trade, the standards that technician must meet vary from one area to another. Having industry subject matter experts from your area help develop curriculum ensures that you are training students to meet the needs of the jobs that are available.
It is imperative, during this step, that the educators really listen to the industry partners. Employers are often eager to participate in this process because it ensure that they will have a new pipeline of candidates who meet the qualifications that they need. Only the industry can articulate exactly what is essential for technicians within their field.

Step 2: Create Goals, Objectives, and Assessment

Once the curriculum committee is formed, they must decide what they want to achieve from the curriculum. This is a back end approach that works toward a finale goal. Many curriculum developers may skip this step and start with outlining the topics they want to cover. Without a clear purpose in mind though, the curriculum may be disorganized and lead to knowledge gaps for the students. The goals for the curriculum should always directly tie into meeting the needs determined in the first step. The aim for most secondary technology education programs is to create a student equipped with the basic knowledge needed to either move into the industry at an entry-level position or continue their training at a post-secondary institution. While setting the standard for what the institution ultimately wants to achieve, this broad intention does not define the goals that will be needed to accomplish it. To create a well-rounded curriculum, it is important to balance how many goals are set for the program. Setting too many goals will not allow them to be sufficiently accomplished. Having too few goals will generate a student without enough knowledge. Goals can include both technical aspects and soft skills.

Once goals for the curriculum are developed, specific objectives that enable those goals to be met will be detailed. Much like the college level DACUM process, during this step these subject matter experts will break down the goal into specific skill sets needed. While needing to be specific, educators must ensure that these objectives are also achievable by the students based on their age-level abilities. The curriculum developers also need to focus on ensuring that they have completely outlined all the objectives needed to be able to reach the goal.
The final part of this step is to determine how assessment will be performed to determine if the objectives and goals will be accomplished. This may seem backwards that assessment is being decided before the course materials have even been created, but this part of the curriculum development process helps to focus instruction and ensures the alignment of curriculum to the instruction. Assessment drives the curriculum and measures not only student progress, but also the effectiveness of the goals and objectives of the curriculum in meeting the determined needs.

**Step 3: Create Content**

Prior to this step, all the work was in planning for the curriculum. With step three in the process, developers start with the actual creation of curriculum. Specific lessons and materials will be established that provide the exact information needed to accomplish objectives. Often curriculum developers falsely believe that brand new content must be produced in order to meet curriculum goals. It is important, though, during this step to research currently available content and curriculum. Many non-profit organizations, industry associations, and government agencies or education grants will have already created free content to meet exact industry needs. Even of the curriculum does not meet all the developed goals and objectives, modifying existing curriculum is faster and easier than starting from scratch.

**Step 4: Determine Teaching Methods and Resources**

Although industry participation is essential to all the steps in the curriculum development process, it can be invaluable during this phase. Secondary schools may have difficulty in finding teachers that have the technological and industry knowledge needed, as well as the teaching certifications required. Industry partners with an investment in and commitment to the curriculum can help schools bridge that gap. Currently employed
technicians can be “borrowed” from industry partners to teach specific modules of content. Not only does this allow the curriculum to explicitly meet the needs of the industry, it also creates mentoring relationships for students with actual industry technicians. Industry partners can also offer tours of their facilities as field trips for the students or internships as part of a cap stone project. One of the most valuable ways that employers can help during this stage, though, is with resources. Often companies will be willing to donate old equipment to schools. The employer receives a tax write-off for the donation and ensures that students are receiving the hands on training in the classroom that simulates what they will experience on the job. This type of equipment can often be unattainable with the budgets of most school systems.

*A curriculum development worksheet can be found in the appendix demonstrating the first four step of the process.*

**Step 5: Implementation**

Implementation of the developed curriculum includes all the specific approval steps required by individual states and districts to enact new curriculum. It can also include the construction/purchase/set up of labs and equipment for the curriculum. The final stage of the step is the actual teaching of the curriculum to the students.

**Step 6: Evaluate Effectiveness**

If determining the needs is the key to successful curriculum creation, evaluating the effectiveness of the curriculum is the key to successful implementation of the curriculum. Industry partners that assisted with the creation of the curriculum should be retained as an advisory board for the program. It is imperative that assessments are regularly reviewed to ensure that program, needs, preferences for resources and materials, and lessons are successfully meeting the goals. Assessing and removing those items that do not seem to be
working effectively is also just as important. Additionally, high technology industries can rapidly change, and curriculum will need to be updated to meet the changing needs.

Summary

Creating a high school technology curriculum to meet the needs of an industry benefits both the students and the employers. Student obtain work-ready skills to either directly enter the industry or continue their education at a community college. Employers receive a pipeline of new workers that they know have the exact skills they need. Community Colleges profit from a potential pipeline of students to enter their training programs and pathways. Secondary schools are able to more fully prepare their graduates. These joint benefits make collaboration between industry employers, community colleges, and secondary schools, to create these programs, not only in the best interest of everyone, but highly successful as well.
References


### Broad Goal for Curriculum: (Step 1 - Determine Needs) <type here>

<table>
<thead>
<tr>
<th>Goal 1: (Step 1, Part 1 - Determine Goals) &lt;type here&gt;</th>
<th>Assessment: (Step 2, Part 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objective 1:</strong> (Step 2, Part 2 Determine Objectives)</td>
<td><strong>Lessons:</strong> (Step 3: Create Content)</td>
</tr>
<tr>
<td>&lt;type here&gt;</td>
<td>&lt;type here&gt;</td>
</tr>
<tr>
<td><strong>Objective 2:</strong> (Step 2, Part 2 Determine Objectives)</td>
<td><strong>Lessons:</strong> (Step 3: Create Content)</td>
</tr>
<tr>
<td>&lt;type here&gt;</td>
<td>&lt;type here&gt;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Goal 2: (Step 1, Part 1 - Determine Goals) &lt;type here&gt;</th>
<th>Assessment: (Step 2, Part 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objective 1:</strong> (Step 2, Part 2 Determine Objectives)</td>
<td><strong>Lessons:</strong> (Step 3: Create Content)</td>
</tr>
<tr>
<td>&lt;type here&gt;</td>
<td>&lt;type here&gt;</td>
</tr>
<tr>
<td><strong>Objective 2:</strong> (Step 2, Part 2 Determine Objectives)</td>
<td><strong>Lessons:</strong> (Step 3: Create Content)</td>
</tr>
<tr>
<td>&lt;type here&gt;</td>
<td>&lt;type here&gt;</td>
</tr>
</tbody>
</table>