# Integrating Liberal Studies at the Assignment Level – A Case Study

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Abstract:

The definition of liberal arts has evolved from its Roman origins, and its renaissance expansion. While there are many modern interpretations of what constitutes a liberal arts curriculum, one distinction has remained throughout; a focus on and value of intellectual rather than vocational skills. This paper demonstrates an approach to integrating those intellectual skills to enhance vocational ones.

As a result of industry feedback, a community college adopted four Workforce Skills to be integrated into the entire curriculum. Multiple ways of measuring each competency were also identified for each competency.

The skills identified were:

- Communication Skills - Communicate effectively through speaking, listening, and writing.
- Critical Thinking - Use critical thinking to analyze and solve problems.
- Technical Skills - Demonstrate knowledge and competence in academic and technical fields of study.
- Interpersonal Skills - Demonstrate positive, effective, and appropriate interpersonal skills.

With the exception of technical skills, these fall within the modern definition of liberal studies. This case study describes how one technical program integrated these skills into its laboratory intensive program. The subject of this study was a Tool, Die and Mold Making program, leading to an Associate of Applied Science degree.

Identifying linkage to outcomes such as these is fairly common at the program and course level. In this study, the relevant skills are integrated at the assignment level as well. In courses where assignments did not support these skills, assignments were added or modified as appropriate. For example: communication, critical thinking, and teamwork were integrated into laboratory (machining) sections through the use of individual and team based projects. These projects required written plans, written evaluations at the conclusion, a reflective paper to cement learning, and a presentation to the class and others.

This paper will provide a detailed description of how this integration and the demonstration of these competencies were achieved. Linkages between all assignments and the relevant liberal studies items (Workforce Skills) will be identified. The paper will also discuss the how the integration of each of these liberal studies skills enhances the application of technical skills and job readiness.

## Background

Accountability of educators and institutions has been a growing issue for several decades. One result has been a report from a U.S. Department of Labor study group called The Secretary's Commission on Achieving Necessary Skills (SCANS). This report defines the skills that will be required for employability in the 21st century. This skill list has been modified and adopted by many institutions. The SCANS report of 2000[1] identified the following essential workforce skill areas; use of resources, acquiring and using information, interpersonal skills, understanding systems, selecting and using technology, basic skills, thinking skills, and personal qualities.

This report was the starting point for the definition of 21st century Workforce Skills at a community college. A college team was assembled to review this report, assess its applicability to local employers and community college graduates, and advise on implementation. Local employers were interviewed to determine which of these Workforce Skills best fit and best served graduates of 2 year technical programs. The team recommended that four workforce skill categories, which integrate a number of the SCANS categories, be implemented college wide. This paper is a report of how that implementation was accomplished in a two year Tool, Die and Mold Making Associate of Applied Science degree program, and reflects one aspect of the redesign of that program. It will be no surprise to those in the liberal arts, or whose hearts are there, that this Workforce Skills list closely parallels many elements of a liberal arts education. While there are many modern interpretations of what constitutes a liberal arts curriculum, one important distinction is a focus on and value of intellectual rather than vocational skills. The philosophy of the college and the basis for this paper is that intellectual skills may enhance vocational skills.

## Workforce Skills

Jonathan Becker[2] offers one definition of a liberal arts education as "...a system of higher education designed to foster in students the desire and capacity to learn, think critically and communicate proficiently and to prepare them to function as engaged citizens. It is distinguished by a flexible curriculum that allows for student choice and demands breadth as well as depth of study, and by a student centered pedagogy that is interactive and requires students to engage directly with critical texts within and outside of the classroom." Alignment of the Workforce Skills with this definition is apparent in items one and two. Items three and four also help students to prepare to function as engaged citizens. Integration of the Workforce Skills also included making the curriculum more flexible and student centered. This is not meant to suggest full integration of liberal studies in this curriculum, but only to demonstrate that it is possible to incorporate many of its elements. Vocational programs are by nature more narrow and applied, but the integration of these elements serves to enhance that vocational experience.

The Workforce Skills identified for integration, and acceptable methods of assessment are listed below.

**# 1 Communicate effectively through speaking, listening, and writing.**

*These competencies will be measured by the ability to:*

a) Deliver clear, well-organized verbal presentations that are appropriate for purpose and audience.
b) Use comprehensive listening skills to evaluate messages and respond appropriately.
c) Demonstrate the ability to organize ideas, to write clearly and coherently, and to employ conventional mechanics, usage and grammar.

**# 2 Use critical thinking to analyze and solve problems.**

*These competencies will be measured by the ability to:*

a) Recognize the problem, review information about the problem, develop possible solutions and evaluate the results.
b) Apply mathematical reasoning and problem solving related to the discipline of study.

**# 3 Demonstrate knowledge and competence in academic and technical fields of study.**

*These competencies will be measured by the ability to:*

a) Use computers, printed materials and human resources to access and process information.
b) Read and comprehend materials related to the discipline of study.
c) Possess the necessary academic knowledge and technical skills for entry into employment and/or further study.

**#4 Demonstrate positive, effective, and appropriate interpersonal skills.**

*These competencies will be measured by the ability to:*

a) Demonstrate dependable, accountable, flexible behavior.
b) Work effectively and appropriately with others through collaboration and teamwork.
c) Choose ethical courses of action.
d) Demonstrate effective time management skills.

The Framework

In order to truly integrate these important Workforce Skills, and have a meaningful impact on the readiness of our students, is was necessary to change what and how we teach. Prior to this effort, emphasis in the major courses was on technical content. Mathematics, communication, and other traditional liberal arts subjects were mostly left to the courses in those departments. It was apparent that merely imposing the skills framework over our existing approach would not be effective. It was fairly easy to identify alignment of the program curriculum with the Workforce

Skills. This could also be done at the course level, but real integration meant that we had to change things at the assignment level.

Integration at the program level

The Tool, Die & Mold Making program consisted of machining, blueprint reading and drafting, and computer numerical control courses. Additional courses in math, communications, writing and humanities and behavioral science electives were also required. The entire curriculum is detailed in table 1. The integration of the Workforce Skills at the program level is as simple as identifying which courses are aligned with each skill. For example, the communications skill aligns with two English classes (Eng 111 and 114), and a communications class (Com 120). These courses are listed under "Other Required Courses", and were often viewed as extraneous by faculty, and especially students.

| Core courses<br>Required subject areas: | |
|---|---|
| Machining:<br>MAC 111 Machining Technology I<br>MAC 112 Machining Technology II<br>MAC 151 Machining Calculations<br>MAC 124 CNC Milling<br>MAC 122 CNC Turning<br>MAC 113 Machining Technology III | Concentration<br>MAC 243A Die Making IA<br>MAC 243B Die Making I B (LAB)<br>MAC 244A Die Making IIA<br>MAC 243B Die Making II B (LAB)<br>MAC 245A Mold Construction I A<br>MAC 245B Mold Construction I B (Lab)<br>MAC 246A Mold Construction II A<br>MAC 246B Mold Construction II B (Lab)<br>MAC 153 Compound Angles<br>MAC 226 CNC EDM Machining |
| Blueprint Reading<br>BPR 111 Blueprint Reading<br>BPR 121 Blueprint Reading: Mechanical | Other Major Hours<br>PLA 220 Mold Flow<br>PLA 120 Injection Molding<br>CIS 113 Computer Basics<br>MEC 110 CAD/CAM<br>DFT 151 CAD I |
| Other Required Hours<br>ENG 111 Expository Writing<br>COM 120 Interpersonal Communications<br>ENG 114 Professional Research and Reporting<br>MAT 121 Algebra/Trigonometry I<br>Humanities Elective<br>Social/Behavioral Science Elective | |

Table 1. Curriculum

This alignment at the program level serves to validate the structure of the curriculum, but does nothing to integrate the skills at a deeper level.

Integration at the course level

Integration at the course level is more granular. We can align the Workforce Skills with an existing list of course objectives or outcomes. While this provides a much greater level of detail and to a degree identifies the existing state of integration, it still does little to change it. For example; course objectives from Mold Making I lecture and lab (MAC 245A & B) are shown in table 2, with linkages to the Workforce Skills.

| **Course Objectives** | **Related Workforce Skills** |
|---|---|
| **MAC 245A - Mold Making I Classroom** | |
| By the end of this course, you will be able to: | |
| Select plastic material | 2a, 3a, 3b, 3c |
| Calculate runner size | 2a, 2b, 3a, 3b, 3c |
| Calculate part shrinkage | 2a, 2b, 3a, 3b, 3c |
| Calculate draft dimensions | 2a, 2b, 3a, 3b, 3c |
| Recommend gate types | 2a, , 3a, 3b, 3c |
| Describe different molding processes | 1c, 2a, , 3a, 3b, 3c |
| Identify mold parts and explain their function | 1c, 2a, 3a, 3b, 3c |
| Design (sketch and dimension) a simple mold | 2a, 3a, 3b, 3c, |
| **245B - Mold Making I Laboratory** | |
| By the end of this course, you will be able to: | |
| Square the mill head to the table | 2a, 2b, 3c |
| Square a milling vise to the table | 2a, 2b, 3c |
| Calculate grind stock | 2a, 2b, 3c |
| Grind flat, parallel and to dimension within +/- .0002” | 2a, 2b, 3a, 3b,3c |
| Grind square and to dimension within +/- .0002” | 2a, 2b, 3a, 3b,3c |
| Create and Follow a project plan | 2a, 2b, 3a, 3b,3c, 4d |
| Select appropriate grinding wheels | 2a, 2b, 3a, 3b, 3c |
| Follow proper safety procedures when working with molds | 2a, 2b, 3a, 3b, 3c |
| Assemble and disassemble molds properly | 2a, 2b, 3a, 3b, 3c |
| Perform preventative maintenance on molds | 1a, 3a, 3b, 3c |
| Explain the injection molding process. | 1a, 3a, 3b, 3c |
| Identify and describe the function of mold components | 1b, 4a, 4b, 4c, 4d |
| Perform as a team member on a complex project | |

Table 2. Integration at Course Level

Table 2 illustrates a fairly high degree of integration of the Workforce Skills at the course level. This integration is natural, but not intentional. It occurred because these Workforce Skills are genuinely a part of the profession. But, because it lacked intention the integration was not purposeful or complete. It may be noted that there is little emphasis on categories 1 and 4, and heavy emphasis on the more technical categories 2 and 3.

Integration at the assignment level

Assignments were added or modified to provide better integration of the Workforce Skills for both lecture and lab sections of every core course within the second year of the major. These second year courses were Die Making I & II, Mold Construction I & II, and CNC EDM Machining. All five of these courses have both lecture and laboratory requirements, with laboratory accounting for about 80% of the total contact hours. These courses were chosen for initial implementation because they were taught by a single instructor. Integration of these Workforce Skills at the assignment level both demonstrates and reinforces the importance and application of skills which have traditionally resided in the liberal arts.

The laboratory experiences comprise a significant portion of each major course. Each lab consists of multiple project assignments; including both individual and team projects. Several changes were made to assignments in the lab section of Mold Making I. Planning for each individual project and documenting results had always been part of the course, but tended to be informal. After assignment level integration, each project requires a written plan and documented results. Additionally, students are required to write a short reflective paper after each project summarizing what went well with the project, what might be improved in the future, and lessons learned. A similar approach is used for the semester long team project, but a longer paper is required as part of the team project. This paper is the basis for a presentation at the end of the semester. Structured team planning, reporting and presentation, as well as peer review emphasize and reinforce the skills in item 4.

Changes were also made in the lecture portion of courses within the major. In Mold Making I for example (MAC 245A), quizzes were deemphasized, and a research assignment was added. Similar changes were made to the lecture sections of other courses. Students were asked to research a topic of their choosing, relevant to the course, and write a short paper about it. Students would submit a topic, a first draft, and a final draft at various points throughout the semester. Only the final draft was graded. The topic and first draft provided a mechanism for the instructor to give feedback and guide the research and writing. A design project had been part of the course, and was expanded. Students were required to submit a short paper that justifies their design decisions including citations of research sources. Both of these assignments reinforce critical thinking and reflection, and promote student directed learning.

These assignment changes created a stronger emphasis on intellectual skills that have traditionally resided in the liberal arts. Table 3 presents a sample of assignments for one technical course. MAC 245A is the lecture part of Mold Construction I, and MAC 245B is the laboratory part. These assignments are not just additional work, but create focus on liberal arts skills that is integrated with the more technical aspects of the course.

| New Assignment | Relevant Workforce Skills |
|---|---|
| MAC 245B - Written project plan | 1c, 2a, 2b, 3a, 3b, 3c, 4d |
| MAC 245B - Documentation of project outcomes | 1c, 2a, 2b, 3a, 3b, 3c, 4d |
| MAC 245B - Reflective paper | 1c, 2a, 2b, |
| MAC 245B - Team project paper | 1b, 1c, 2a, 2b, 3a, 3b, 3c, 4a, 4b, 4c, 4d |
| MAC 245B - Team project presentation | 1a, 1b, 1c, 2a, 2b, 3a, 3b, 3c, 4a, 4b, 4c, 4d |
| MAC 245A - Research paper | 1c, 2a, 2b, 3a, 3b, 3c |
| MAC 245A - Design justification paper | 1c, 2a, 2b, 3a, 3b, 3c |

Table 3. Assignment level integration

It should be noted, that while these additional assignments are graded for writing skills, this is a small part of the grade. Written assignments had fairly short length requirements so they would not be too onerous for students whose interests were primarily technical. The primary intention was to reinforce the habits of planning, writing and reflection, and the relationship of these habits to technical fields.

## Conclusions

In addition to fulfilling the college wide integration requirement, there were several objectives for this effort. Teaching students how to write was beyond the scope of this project and its objectives. The intention of these assignments is to demonstrate to students the value of these skills within their chosen discipline, and to provide practice to reinforce the habits of planning, writing and reflection. The same is true for problem solving, research skills and speaking. The inclusion of these assignments in their major courses also facilitates a different view of the "other required hours" in the curriculum. Instead of simply being courses that they must take to earn the degree, the skills gained in these courses can be readily applied to the technical courses within the major. No formal evaluation of this integration effort was performed, but student feedback suggests that these efforts were successful. Students were not universally happy about additional writing requirements, but many agreed that they saw the value, even though they may have disliked the task. Students also seemed to view support courses differently. Instead of additional required courses, students reported seeing stronger connections between support courses and the technical courses.

There are barriers to the full implementation of this model. The core courses for the program described were taught by an instructor with a liberal arts background, who embraced these changes. Other, more technically oriented instructors my harbor the same ambivalence towards the liberal arts that is often seen in technical students. One possible way around this barrier would be for the implementation to be a collaborative effort between technical and liberal arts faculty. Faculty may need help devising and defining the appropriate assignments. A coordinated effort might help liberal arts faculty to incorporate these same assignments into their own courses, so that students are more engaged.

References:

1. U.S. Department of Labor; The Secretary's Commission on Achieving Necessary Skill. Jobs: *A SCANS report for America 2000*. (1999) Downloaded July 2003 from http://wdr.doleta.gov/opr/FULLTEXT/1999_35.pdf

2. Becker, Jonathon (2003). What Liberal Education is - and Is Not. Bard Institute for International Liberal Education. Downloaded September 2012 from http://iile.bard.edu/lib/db_essays.php?action=getfile&id=66343506