# The Promise of DIGITAL BADGES

By John C. Foster

As an educator, one of the most rewarding career moments is watching students succeed. Student success comes in many forms—meeting individual goals, earning certifications, showing growth and, ultimately, completing a program—but it doesn't stop there. Job interviews provide students with their first real opportunity to showcase successes to potential employers. Enhancements in technology have created some exciting new tools to "display" individual achievements to potential employers. Enter the world of digital badges!

Digital badges are gaining traction and are no longer considered a technology of the future. Recent articles, such as Joanne Jacobs' usnews.com article, "Digital Badges Threaten Colleges' Monopoly on Credentials,"[1] and Lynn O'Shaughnessy 's cbsnews.com article, "Forget the College Degree: Earn Digital Badges Instead,"[2] certainly indicate that badges are here and, very likely, are here to stay.

Digital badges can be used to supplement a "conventional" resume and/or portfolio, which traditionally provide educational achievements, association memberships, community service and samples of work. The real beauty of digital badges lies in a set of metadata that provides an easily verifiable method for potential employers to not only verify the authenticity of the badge, but also enable them to see the specificity of an individual's skills.

Badges arrived on the educational scene at a time when grades, diplomas and transcripts were not providing the proof of skills employers deemed relevant. As students increasingly complete a variety of massive open online courses (MOOCs) at no cost,[3] badges provide a way to verify learning after completion. Finally, digital badges are creating a very simple and efficient way for employers to validate the skills of their existing workforce.

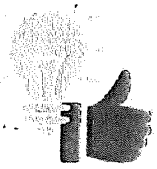
## What Is a Digital Badge?

The MacArthur Foundation describes a digital badge as "an assessment and credentialing mechanism that is housed and managed online. Badges are designed to make visible and validate learning in both formal and informal settings, and hold the potential to help transform where and how learning is valued."[4] A badge is a digital indicator of one's skills, performance, achievement and, perhaps, even personal qualities. Badges can relate to almost any aspect of life, but this article focuses on their potential to impact career and technical education (CTE). Thanks to electronic technologies and the proliferation of electronic networking, digital badges have the potential to revolutionize education. You can see a short video representation of a badge definition through YouTube.[5]

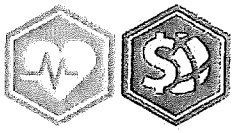
Learning occurs everywhere, and a digital badge system provides a tool to help document learning. Many newcomers to the badge world often draw a parallel between digital and merit badges, like those earned through a scouting program. Though there are obvious similarities, the comparison can be a bit limiting. Unlike a merit badge, which symbolizes past achievements, digital badges contain real data, verifiable instantly by a third party. Badges are digitally-issued pieces of personal property that can be moved and displayed anywhere in our electronic world. Though they are symbols, or images, each badge is electronically linked to validated information, including who issued the badge and the standards the badge was issued on. An example may help to better explain the process and potential of digital badges. José is a student enrolled in a Robotic Maintenance program, and he's interested in earning a credential. He has recently learned that a digital badge is also available. To earn the credential and the badge, José must successfully perform tasks on a metallic-wire 3D printer to fabricate replacement parts. After completing the tasks and earning a digital badge verifying his skills and competence, he chose to share his badge through his LinkedIn page. An employer's online search led

# THE BADGE ECOSYSTEM

**Thanks to electronic technologies and the proliferation of electronic networking, digital badges have the potential to revolutionize education.**



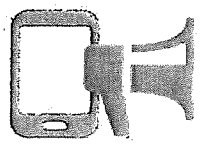
**First, there is the "issuer," which is any individual or institution with a desire to award a badge recognizing a skill or knowledge.**



**Next are the digital "badges" themselves, which are electronic representations of skills or knowledge that learners have achieved.**

**The third component is the "learner." Learners are those who actually earn badges for completing different projects, demonstrating various skills, and/or completing a standards-based credential.**

**The next component is "badge storage." Badge storage and display can be done in a variety of places, including websites, school-based networks, cloud-based services and social media outlets.**



**The last component of the badge ecosystem is generally thought of as "displayers," which, as the name implies, is a place where digital badges can be viewed.**

## The Badge Ecosystem

The badge ecosystem consists of five components. First, there is the "issuer," which is any individual or institution with a desire to award a badge recognizing a skill or knowledge. Next are the digital "badges" themselves, which are electronic representations of skills or knowledge learners have achieved that contain metadata enabling the badge to be shared and verified by anyone at anytime. The third component is the "learner." Learners are those who actually earn badges for completing different projects, demonstrating various skills, and/or completing a standards-based credential. The next component is "badge storage." Currently, the most popular storage tool is the Mozilla Backpack that allows learners to store, organize and manage their earned badges. Badge storage and display can be done in a variety of other places, including websites, school-based networks, cloud-based services and social media outlets. The last component of the badge ecosystem is generally thought of as "displayers," which, as the name implies, is a place where digital badges can be viewed. These locations can be private or public, allowing them to also be displayed on employer websites, job boards like Monster.com or as part of other electronically circulated resume services.

## Badge History

It is generally accepted that badges evolved from the gaming industry where they were used as a recognition tool. Interestingly enough, they also became a source of motivation. A person's internal sense of achievement could now be displayed as an outward digital symbol. An individual could earn a bronze, silver or gold "medal" for an outstanding score and could move up based on the level achieved. In its gaming roots, a badge could also be immediately verified by the game producer through confirmation of scores and dates. Lastly, this badge was a means to establish a gamer's credibility. An individual may have only earned a score of zero to 100, which qualified as a novice, but a score over 10,000 points could earn an individual an expert-level badge.

Though badges are still in their infancy, the concept has been recognized outside the gaming field. Employers can recognize an employee's advancement in internal training related to topics like standard operating procedures or safety. Cultural organizations can acknowledge contributions of constituents, and community-based organizations can recognize individuals for their contributions to better the community, including participation in a Habitat for Humanity project or a blood drive. The possibilities are endless!

The focus of this article is on education, so it is important to take a closer look at the type of history that exists there. In higher education, Purdue University has developed the "passport" that recognizes and charts learning activities designed as student-challenge activities. They are also using badges to capture certain extracurricular activities that may not appear on a college transcript.[6]

Last year, the "Chicago Summer of Learning" was one of the largest interactive learning projects, as well as one of the most visible displays of badges

With the focus on capturing skills and competencies, a badge provides a much broader picture of an individual, allowing viewers to see beyond the classroom.

to date. A collaboration of educators, businesses and community organizations utilized badges to recognize students for knowledge gained over the summer in a topic that interested the student. For the city of Chicago, this was a way to show that learning really matters and that it was occurring citywide.[7]

## Badge Benefits

There are multiple benefits for individuals earning a badge. With the focus on capturing skills and competencies, a badge provides a much broader picture of an individual, allowing viewers to see beyond the classroom. Think about the benefits of combining a resume or LinkedIn profile with an online tool that displays verified information about specific skills. This information would be delivered not by a grade on a transcript, but by third-party validation of an actual skill. Think, too, about the convenience and ability to store, update and share skills in a cloud-based environment. Simultaneously, individuals earning and displaying badges reinforce society's positive values of openness and sharing. Digital badges also serve as a way to document an individual's dedication to a lifelong pursuit of learning.

Another benefit related to the value of openness is the emphasis on connectivity. A badge can be a verifiable way to connect a learner with an issuer almost instantly. Consider the connectivity of learning contexts, too. Viewing a badge that shows a skill in a technical area could also be interpreted as a learner's ability to problem solve, complete a project on time or implement research.

Badges can facilitate instructional management by easily capturing a student's path to learning and related interests. What about using badges to improve instruction? A badge could be used as a motivational tool, a means of encouragement or as a way to reinforce that multiple pathways can be used to get to a particular goal. Badges could also be used to support learning in emerging fields, documenting skill sets to be used for building a base of knowledge.

## Badging and CTE

The *Futurist* magazine recently ran an article on the top 10 "disappearing futures." One of the futures mentioned as likely to disappear or decline in importance is grade point average. However, the article goes on to talk about the power of badges to identify specific skills—and CTE is a goldmine for specific skills![8]

There are many opportunities to infuse badges in CTE. Consider using badges for the following applications:

- Capture technical skills along the path of program completion.
- Document a student's ability to use a piece of equipment.
- Demonstrate knowledge of a particular topic (e.g., safety).
- Demonstrate both a technical skill and the related academic theories.

These points get us thinking of the ways digital badges could enhance CTE, which naturally generates additional questions including:

- Would badges help in eliminating duplicative instruction?
- Could workplace foundational skills demonstrated through a career and technical student organization (CTSO), or any service-based organization, be demonstrated through a badge?

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- Could badges be awarded for internships, cooperative-education experiences or apprenticeships?
- Would badges increase retention and program completion?
- Could badges be awarded as part of dual- and articulated-credit programs?

## Looking Forward

Proponents view badges as an educational revolution—one that is specifically suited for CTE educators. There is strong alignment between badges and CTE since they both focus on skills. NOCTI believes that the CTE community will be well served by embracing the concept of badges. Certainly there is risk, but if implemented thoughtfully, badges hold great potential for our field.

## NOCTI and Badges

NOCTI is a 501(c)(3), governed by a consortium of the 50 state CTE directors and elected board of CTE constituents, which is moving forward with digital badges. Our IT staff have been participating in the Mozilla weekly development calls and have turned their attention toward implementation. This spring, we will be working with innovative leaders in Pennsylvania, Minnesota and California to beta test a badge-delivery system focused on recognizing students earning college credit recommendations for successfully completing a NOCTI assessment. We are also in discussions regarding a badge system for teacher and industry certification.

Badges have come a long way in a short amount of time and their potential is limitless. Badges are uniquely suited to CTE, and they provide yet another opportunity for our community to demonstrate leadership.

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## Endnotes


1. Jacobs, J. (2012, January 20). Digital badges threaten colleges' monopoly on credentials. Retrieved from www.usnews.com/education/best-colleges/articles/2012/01/20/digital-badges-threaten-colleges-monopoly-on-credentials
2. O'Shaughnessy, L. (2011, October 3). Forget the college degree: Earn digital badges instead. Retrieved from www.cbsnews.com/8301-505145_162-37246793/forget-the-college-degree-earn-digital-badges-instead/
3. To learn more about MOOCs, go to the BDPA Detroit site at: www.bdpa-detroit.org/portal/index.php?Itemid=20&catid=29:education&id=57:moocs-top-10-sites-for-free-education-with-elite-universities&option=com_content&view=article
4. Quote from: www.macfound.org/programs/digital-badges. For more on the MacArthur Foundation's involvement in digital badges, see the June 13, 2013, press release: Better futures for 2 million Americans through open badges at: www.macfound.org/press/press-releases/better-futures-2-million-americans-through-open-badges/#sthash.wdtyKO6b.dpuf
5. To view one of the most concise explanations of badges and their potential, go to www.youtube.com/watch?v=HgLLq7ybDtc
6. The Purdue website at www.itap.purdue.edu/studio//passport/ has more information about badges.
7. The website www.chicagosummeroflearning.org contains more information about the Chicago Summer of Learning.
8. Tuuri, D. (2013, September-October). The end of grade point averages in Top 10 disappearing futures. *The Futurist*, 47(5). Retrieved from www.wfs.org/futurist/2013-issues-futurist/september-october-2013-vol-47-no-5/top-10-disappearing-futures/disap-0


### Explore More

If your state is interested in participating in a badge initiative with NOCTI, please contact us at nocti@nocti.org.

# WELDING TECHNOLOGY FOUNDATIONAL PROGRAM STANDARDS FY 2014

## CONTENT STANDARDS 1.0: IDENTIFY LAB ORGANIZATION AND SAFETY PROCEDURES

### PERFORMANCE STANDARD 1.1: DEMONSTRATE GENERAL LAB SAFETY RULES AND PROCEDURES

1.1.1 Describe general shop safety rules and procedures (i.e., safety test)
1.1.2 Describe OSHA in workplace safety
1.1.3 Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities (i.e., personal protection equipment – PPE)
1.1.4 Operate lab equipment according to safety guidelines
1.1.5 Identify and use proper lifting procedures and proper use of support equipment (i.e., rigging, chains, straps, cables)
1.1.6 Utilize proper ventilation procedures for working within the lab/shop area
1.1.7 Identify marked safety areas
1.1.8 Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment
1.1.9 Identify the location and use of eye wash stations
1.1.10 Identify the location of the posted evacuation routes
1.1.11 Identify and wear appropriate clothing for lab/shop activities
1.1.12 Secure hair and jewelry for lab/shop activities
1.1.13 Demonstrate knowledge of the safety aspects of high voltage circuits
1.1.14 Locate and interpret material safety data sheets (MSDS)
1.1.15 Perform housekeeping duties
1.1.16 Follow verbal instructions to complete work assignments
1.1.17 Follow written instructions to complete work assignments
1.1.18 Identify requirements for Hot Work Permits
1.1.19 Identify what constitutes a confined space

### PERFORMANCE STANDARD 1.2: IDENTIFY & UTILIZE HAND TOOLS

1.2.1 Identify hand tools and their appropriate usage
1.2.2 Identify standard and metric designation
1.2.3 Demonstrate safe handling and use of appropriate tools
1.2.4 Demonstrate proper cleaning, storage, and maintenance of tools

### PERFORMANCE STANDARD 1.3: IDENTIFY & UTILIZE POWER TOOLS AND EQUIPMENT

1.3.1 Identify power tools and equipment, and their appropriate usage
1.3.2 Demonstrate safe handling and use of appropriate power tools and equipment
1.3.3 Demonstrate proper cleaning, storage, and maintenance of power tools and equipment

## CONTENT STANDARDS 2.0: APPLY FUNDAMENTAL PRINT READING, MEASUREMENT AND LAYOUT/FIT-UP TECHNIQUES

### PERFORMANCE STANDARD 2.1: DEMONSTRATE PRINT READING AND SKETCHING PRACTICES

- 2.1.1 Interpret basic elements of a technical drawing (i.e., title block information, dimensions, line types)
- 2.1.2 Identify and explain industry standard welding symbols
- 2.1.3 Prepare a materials list from a technical drawing (i.e., bill of material)
- 2.1.4 Describe various types of drawings (i.e., part, assembly, pictorial, orthographic, isometric, and schematic)
- 2.1.5 Understand dimensioning, sectional drawings, fasteners, tables, charts, and assembly drawings
- 2.1.6 Sketch or draw a basic welding drawing
- 2.1.7 Fabricate parts from a drawing or sketch

### PERFORMANCE STANDARDS 2.2: DEMONSTRATE MEASURING AND SCALING TECHNIQUES

- 2.2.1 Identify industry standard units of measure
- 2.2.2 Convert between customary (i.e., SAE, Imperial) and metric systems
- 2.2.3 Measure and calculate size, area, and volume
- 2.2.4 Determine and apply the equivalence between fractions and decimals
- 2.2.5 Identify measuring tools

### PERFORMANCE STANDARDS 2.3: UTILIZE LAYOUT PRINCIPLES AND PRACTICES

- 2.3.1 Interpret drawing, sketch or specification information
- 2.3.2 Prepare work area for layout
- 2.3.3 Select appropriate materials to complete work assignment
- 2.3.4 Use layout and marking tools as required
- 2.3.5 Layout parts using measurement practices

### PERFORMANCE STANDARDS 2.4: DEMONSTRATE PREPARATION AND FIT-UP PRACTICES

- 2.4.1 Identify and explain job specifications
- 2.4.2 Use fit-up gauges and measuring devices to check joint fit-up
- 2.4.3 Identify and explain distortion and how it is controlled
- 2.4.4 Fit-up joints using plate and pipe fit-up tools
- 2.4.5 Check for joint misalignment and poor fit-up before and after welding

## CONTENT STANDARD 3.0: IDENTIFY PROPERTIES OF METALS

**PERFORMANCE STANDARD 3.1: IDENTIFY MATERIAL PROPERTIES AND SCIENCE**

3.1.1 Identify the difference between ferrous and non-ferrous metals
3.1.2 Identify and explain forms and shapes of structural metals

**PERFORMANCE STANDARDS 3.2: IDENTIFY FILLER METALS**

3.2.1 Explain AWS filler metal classifications systems
3.2.2 Identify different types of filler metals
3.2.3 Explain the storage and control of filler metals

## CONTENT STANDARD 4.0: APPLY SHIELDED METAL ARC WELDING (SMAW) TECHNIQUES

**PERFORMANCE STANDARD 4.1: SAFETY PROCEDURES**

4.1.1 Identify and explain different types of welding current and polarity
4.1.2 Perform safety inspections of SMAW equipment and accessories
4.1.3 Maintain SMAW equipment and accessories

**PERFORMANCE STANDARD 4.2: PRODUCE WELDS USING SMAW ON CARBON STEEL**

4.2.1 Set up for SMAW operations
4.2.2 Operate SMAW equipment
4.2.3 Perform welds in the 1F position
4.2.3 Perform welds in the 2F position
4.2.4 Perform welds in the 3F position
4.2.5 Perform welds in the 4F position
4.2.6 Perform welds in the 1G position
4.2.7 Perform welds in the 2G position
4.2.8 Perform welds in the 3G position
4.2.9 Perform welds in the 4G position
4.2.10 Describe 2G, 5G and 6G welding positions

## CONTENT STANDARD 5.0: APPLY GAS METAL ARC WELDING (GMAW-S, GMAW) TECHNIQUES

### PERFORMANCE STANDARDS 5.1: UTILIZE SAFETY PROCEDURES

5.1.1 Identify and explain the use of GMAW equipment (i.e., spray transfer, globular, short circuit, and pulse)
5.1.2 Perform safety inspections of GMAW equipment and accessories
5.1.3 Maintain GMAW equipment and accessories
5.1.4 Demonstrate safe startup, shutdown, disassembly, and cylinder exchange procedures of GMAW equipment

### PERFORMANCE STANDARDS 5.2: PRODUCE WELDS USING GMAW-S ON CARBON STEEL

5.2.1 Set up for GMAW-S operations
5.2.2 Operate GMAW-S equipment
5.2.3 Perform welds in the 1F position
5.2.4 Perform welds in the 2F position
5.2.5 Perform welds in the 3F position
5.2.6 Perform welds in the 4F position
5.2.7 Perform welds in the 1G position
5.2.8 Perform welds in the 2G position
5.2.9 Perform welds in the 3G position

# Idaho Professional-Technical Education

| | Welding Technology Criticality Survey Results | Nice to Know | Need to Know | Critical to Know | Rating Average | Response Count |
|---|---|---|---|---|---|---|
| **CONTENT STANDARD 1: Identify Lab organizations and Safety Procedures** | | | | | | |
| **Performance Standard 1.1: Demonstrate general lab safety rules and procedures** | | | | | | |
| 1.1.1 | Describe general shop safety rules and procedures (i.e., safety test) | 0 | 5 | 19 | 2.79 | 24 |
| 1.1.2 | Describe OSHA in workplace safety | 3 | 11 | 10 | 2.29 | 24 |
| 1.1.3 | Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities (i.e., personal protection equipment – PPE) | 0 | 2 | 22 | 2.92 | 24 |
| 1.1.4 | Operate lab equipment according to safety guidelines | 0 | 7 | 17 | 2.71 | 24 |
| 1.1.5 | Identify and use proper lifting procedures and proper use of support equipment (i.e., rigging, chains, straps, cables) | 0 | 6 | 18 | 2.75 | 24 |
| 1.1.6 | Utilize proper ventilation procedures for working within the lab/shop area | 0 | 10 | 14 | 2.58 | 24 |
| 1.1.7 | Identify marked safety areas | 1 | 10 | 13 | 2.50 | 24 |
| 1.1.8 | Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment | 0 | 8 | 16 | 2.67 | 24 |
| 1.1.9 | Identify the location and use of eye wash stations | 1 | 8 | 15 | 2.58 | 24 |
| 1.1.10 | Identify the location of the posted evacuation routes | 1 | 10 | 13 | 2.50 | 24 |
| 1.1.11 | Identify and wear appropriate clothing for lab/shop activities | 1 | 6 | 16 | 2.65 | 23 |
| 1.1.12 | Secure hair and jewelry for lab/shop activities | 2 | 9 | 13 | 2.46 | 24 |
| 1.1.13 | Demonstrate knowledge of the safety aspects of high voltage circuits | 2 | 5 | 17 | 2.63 | 24 |
| 1.1.14 | Locate and interpret material safety data sheets (MSDS) | 4 | 12 | 8 | 2.17 | 24 |
| 1.1.15 | Perform housekeeping duties | 5 | 13 | 6 | 2.04 | 24 |
| 1.1.16 | Follow verbal instructions to complete work assignments | 0 | 14 | 10 | 2.42 | 24 |
| 1.1.17 | Follow written instructions to complete work assignments | 0 | 14 | 10 | 2.42 | 24 |
| 1.1.18 | Identify requirements for Hot Work Permits | 5 | 9 | 10 | 2.21 | 24 |
| 1.1.19 | Identify what constitutes a confined space | 5 | 7 | 12 | 2.29 | 24 |
| | | | | | | |
| **Performance Standard 1.2: Identify and utilize proper tools** | | | | | | |
| 1.2.1 | Identify hand tools and their appropriate usage | 3 | 14 | 6 | 2.13 | 23 |
| 1.2.2 | Identify standard and metric designation | 9 | 12 | 2 | 1.70 | 23 |
| 1.2.3 | Demonstrate safe handling and use of appropriate tools | 0 | 14 | 9 | 2.39 | 23 |
| 1.2.4 | Demonstrate proper cleaning, storage, and maintenance of tools | 4 | 16 | 3 | 1.96 | 23 |
| | | | | | | |
| **Performance Standard 1.3: Identify and utilize power tools and equipment** | | | | | | |
| 1.3.1 | Identify power tools and equipment, and their appropriate usage | 0 | 18 | 6 | 2.25 | 24 |
| 1.3.2 | Demonstrate safe handling and use of appropriate power tools and equipment | 0 | 12 | 11 | 2.48 | 23 |
| 1.3.3 | Demonstrate proper cleaning, storage, and maintenance of power tools and equipment | 4 | 16 | 4 | 2.00 | 24 |
| | | | | | | |
| **CONTENT STANDARD 2: Apply Fundamental; print Reading, Measurement ans Layout/Fit-Up Techniques** | | | | | | |
| **Performance Standard 2.1: Demonstrate print reading and sketching practices** | | | | | | |
| 2.1.1 | Interpret basic elements of a technical drawing (i.e., title block information, dimensions, line types) | 3 | 14 | 7 | 2.17 | 24 |
| 2.1.2 | Identify and explain industry standard welding symbols | 0 | 15 | 9 | 2.38 | 24 |
| 2.1.3 | Prepare a materials list from a technical drawing (i.e., bill of material) | 7 | 15 | 2 | 1.79 | 24 |
| 2.1.4 | Describe various types of drawings (i.e., part, assembly, pictorial, orthographic, isometric, schematic) | 13 | 11 | 0 | 1.46 | 24 |
| 2.1.5 | Understand dimensioning, sectional drawings, fasteners, tables, charts, and assembly drawings | 5 | 16 | 3 | 1.92 | 24 |
| 2.1.6 | Sketch or draw a basic welding drawing | 11 | 12 | 1 | 1.58 | 24 |
| 2.1.7 | Fabricate parts from a drawing or sketch | 0 | 14 | 10 | 2.42 | 24 |

# Idaho Professional-Technical Education

| | Welding Technology Criticality Survey Results | Nice to Know | Need to Know | Critical to Know | Rating Average | Response Count |
|---|---|---|---|---|---|---|
| | | | | | | |
| **Performance Standard 2.2: Demonstrate measuring and scaling techniques** | | | | | | |
| 2.2.1 | Identify industry standard units of measure | 3 | 15 | 6 | 2.13 | 24 |
| 2.2.2 | Convert between customary (i.e., SAE, Imperial) and metric systems | 11 | 11 | 2 | 1.63 | 24 |
| 2.2.3 | Measure and calculate size, area, and volume | 8 | 14 | 2 | 1.75 | 24 |
| 2.2.4 | Determine and apply the equivalence between fractions and decimals | 4 | 16 | 4 | 2.00 | 24 |
| 2.2.5 | Identify measuring tools | 0 | 18 | 4 | 2.18 | 22 |
| | | | | | | |
| **Performance Standard 2.3: Utilize layout principles and practices** | | | | | | |
| 2.3.1 | Interpret drawing, sketch or specification information | 3 | 17 | 4 | 2.04 | 24 |
| 2.3.2 | Prepare work area for layout | 2 | 19 | 3 | 2.04 | 24 |
| 2.3.3 | Select appropriate materials to complete work assignment | 3 | 13 | 8 | 2.21 | 24 |
| 2.3.4 | Use layout and marking tools as required | 2 | 18 | 4 | 2.08 | 24 |
| 2.3.5 | Layout parts using measurement practices | 0 | 19 | 5 | 2.21 | 24 |
| | | | | | | |
| **Performance Standard 2.4: Demonstrate preparation and fit-up practices** | | | | | | |
| 2.4.1 | Identify and explain job specifications | 3 | 16 | 5 | 2.08 | 24 |
| 2.4.2 | Use fit-up gauges and measuring devices to check joint fit-up | 4 | 15 | 5 | 2.04 | 24 |
| 2.4.3 | Identify and explain distortion and how it is controlled | 4 | 17 | 3 | 1.96 | 24 |
| 2.4.4 | Fit-up joints using plate and pipe fit-up tools | 4 | 17 | 3 | 1.96 | 24 |
| 2.4.5 | Check for joint misalignment and poor fit-up before and after welding | 3 | 14 | 7 | 2.17 | 24 |
| | | | | | | |
| **CONTENT STANDARD 3: I identify Properties of Metals** | | | | | | |
| **Performance Standard 3.1: Identify material properties and science** | | | | | | |
| 3.1.1 | Identify the difference between ferrous and non-ferrous metals | 1 | 17 | 6 | 2.21 | 24 |
| 3.1.2 | Identify and explain forms and shapes of structural metals | 5 | 14 | 5 | 2.00 | 24 |
| 3.1.3 | Explain AWS filler metal classifications systems | 8 | 12 | 4 | 1.83 | 24 |
| 3.1.4 | Identify different types of filler metals | 4 | 18 | 2 | 1.92 | 24 |
| 3.1.5 | Explain the storage and control of filler metals | 4 | 18 | 2 | 1.92 | 24 |
| | | | | | | |
| **Performance Standard 3.2: Identify filler metals** | | | | | | |
| 3.2.1 | Explain AWS filler metal classifications systems | 11 | 10 | 3 | 1.67 | 24 |
| 3.2.2 | Identify different types of filler metals | 5 | 17 | 2 | 1.88 | 24 |
| 3.2.3 | Explain the storage and control of filler metals | 4 | 19 | 1 | 1.88 | 24 |
| | | | | | | |
| **CONTENT STANDARD 4: Apply Shielded Metal Arc Welding (SMAW) Techniques** | | | | | | |
| **Performance Standard: 4.1: Safety procedures** | | | | | | |
| 4.1.1 | Identify and explain different types of welding current and polarity | 2 | 15 | 6 | 2.17 | 23 |
| 4.1.2 | Perform safety inspections of SMAW equipment and accessories | 3 | 16 | 4 | 2.04 | 23 |
| 4.1.3 | Maintain SMAW equipment and accessories | 3 | 19 | 1 | 1.91 | 23 |
| | | | | | | |
| **Performance Standard 4.2: Produce welds using SMAW on carbon steel** | | | | | | |
| 4.2.1 | Set up for SMAW operations | 5 | 15 | 3 | 1.91 | 23 |
| 4.2.2 | Operate SMAW equipment | 4 | 16 | 3 | 1.96 | 23 |
| 4.2.3 | Perform welds in the 1F position | 5 | 14 | 4 | 1.96 | 23 |
| 4.2.4 | Perform welds in the 2F position | 4 | 15 | 4 | 2.00 | 23 |
| 4.2.5 | Perform welds in the 3F position | 5 | 15 | 3 | 1.91 | 23 |
| 4.2.6 | Perform welds in the 4F position | 6 | 14 | 3 | 1.87 | 23 |
| 4.2.7 | Perform welds in the 1G position | 5 | 14 | 4 | 1.96 | 23 |
| 4.2.8 | Perform welds in the 2G position | 4 | 15 | 4 | 2.00 | 23 |
| 4.2.9 | Perform welds in the 3G position | 5 | 15 | 3 | 1.91 | 23 |
| 4.2.10 | Perform welds in the 4G position | 6 | 14 | 3 | 1.87 | 23 |
| 4.2.11 | Describe 2G, 5G and 6G welding positions | 6 | 14 | 3 | 1.87 | 23 |

# Idaho Professional-Technical Education

| Welding Technology Criticality Survey Results | | Nice to Know | Need to Know | Critical to Know | Rating Average | Response Count |
|---|---|---|---|---|---|---|
| **CONTENT STANDARD 5: Apply Gas Metal Arc Welding (GMAW-S, GMAW) Techniques** | | | | | | |
| **Performance Standard 5.1: Utilize safety procedures** | | | | | | |
| 5.1.1 | Identify and explain the use of GMAW equipment (i.e., spray transfer, globular, short circuit, pulse) | 5 | 13 | 5 | 2.00 | 23 |
| 5.1.2 | Perform safety inspections of GMAW equipment and accessories | 5 | 14 | 4 | 1.96 | 23 |
| 5.1.3 | Maintain GMAW equipment and accessories | 2 | 18 | 3 | 2.04 | 23 |
| 5.1.4 | Demonstrate safe startup, shutdown, disassembly, and cylinder exchange procedures of GMAW equipment | 1 | 15 | 7 | 2.26 | 23 |
| | | | | | | |
| **Performance Standard 5.2: Produce welds using GMAW-S on carbon steel** | | | | | | |
| 5.2.1 | Set up for GMAW-S operations | 4 | 11 | 8 | 2.17 | 23 |
| 5.2.2 | Operate GMAW-S equipment | 2 | 13 | 8 | 2.26 | 23 |
| 5.2.3 | Perform welds in the 1F position | 4 | 10 | 9 | 2.22 | 23 |
| 5.2.4 | Perform welds in the 2F position | 3 | 11 | 9 | 2.26 | 23 |
| 5.2.5 | Perform welds in the 3F position | 4 | 11 | 8 | 2.17 | 23 |
| 5.2.6 | Perform welds in the 4F position | 4 | 12 | 7 | 2.13 | 23 |
| 5.2.7 | Perform welds in the 1G position | 4 | 10 | 9 | 2.22 | 23 |
| 5.2.8 | Perform welds in the 2G position | 3 | 11 | 9 | 2.26 | 23 |
| 5.2.9 | Perform welds in the 3G position | 4 | 11 | 8 | 2.17 | 23 |
| | | | | | | |
| **CONTENT STANDARD 6: Apply Flux Cored Arc Welding (FCAW-G) Technique** | | | | | | |
| **Performance Standard 6.1: Utilize safety procedures** | | | | | | |
| 6.1.1 | Identify and explain the use of FCAW-G equipment ) | 3 | 17 | 2 | 1.95 | 22 |
| 6.1.2 | Perform safety inspections of FCAW-G equipment and accessories | 3 | 17 | 2 | 1.95 | 22 |
| 6.1.3 | Maintain FCAW-G equipment and accessories | 2 | 18 | 2 | 2.00 | 22 |
| 6.1.4 | Demonstrate safe startup, shutdown, disassembly, and cylinder exchange procedures of FCAW-G equipment | 1 | 15 | 5 | 2.19 | 21 |
| | | | | | | |
| **Performance Standard 6.2: Produce welds using FCAW-G on carbon steel** | | | | | | |
| 6.2.1 | Set up for FCAW-G operations | 4 | 11 | 7 | 2.14 | 22 |
| 6.2.2 | Operate FCAW-G equipment | 2 | 13 | 7 | 2.23 | 22 |
| 6.2.3 | Perform welds in the 1F position | 4 | 11 | 7 | 2.14 | 22 |
| 6.2.4 | Perform welds in the 2F position | 3 | 12 | 7 | 2.18 | 22 |
| 6.2.5 | Perform welds in the 3F position | 4 | 11 | 7 | 2.14 | 22 |
| 6.2.6 | Perform welds in the 4F position | 5 | 11 | 6 | 2.05 | 22 |
| 6.2.7 | Perform welds in the 1G position | 5 | 10 | 7 | 2.09 | 22 |
| 6.2.8 | Perform welds in the 2G position | 4 | 11 | 7 | 2.14 | 22 |
| 6.2.9 | Perform welds in the 3G position | 5 | 11 | 6 | 2.05 | 22 |
| | | | | | | |