

# The Utility Connection

Powering  
the world  
safely

JULY 2017

A TECHNICAL PUBLICATION OF ASSE'S UTILITIES PRACTICE SPECIALTY

## Developing Employee Expertise

With Cognitive  
Apprenticeships

By Jessica Richardson



©ISTOCK/MONKEYBUSINESSIMAGES

**B**aby Boomers, born between 1946 and 1964, are leaving the workforce in great numbers due to retirement, disability or death. The aging workforce in the U.S. is affecting knowledge transfer in some of the world's most influential organizations. The energy industry is undergoing acute population shifts due to the aging workforce. Smith (2013) notes the duality of the challenges that are occurring due to mass retirements of baby boomers:

Federal Mine Safety and Health Administration data, for example, show 46% of the workforce will be eligible to retire within 5 years, but there are too few younger workers in the pipeline to replace them. The oil and gas industry, meanwhile, has a workforce that's currently concentrated at both the older and younger ends of the spectrum, the report says, "creating a gap in experience and maturity" in between and making it difficult to replace retiring leadership.

Cognitive apprenticeship can aid organizations by engaging their more experienced workforce and speeding up the neophytes' learning process. To gain knowledge quickly, the learner must be immersed into a learning situation that just happens to be in the actual workplace. Traditional apprenticeships are common in the energy

sector for manual positions that involve mechanical or electrical skill sets and are offered in "classes," which may contain anywhere from 5 to 20 members per year. Apprenticeship programs have been utilized for hundreds of years in the psychomotor realm. In today's ever-changing workplace, there is a distinct need to keep the knowledge that the baby boomers have acquired over the last 30+ years of dominating the workforce.

To accomplish proper knowledge transfer from the baby boomers to the neophyte workers, organizations should embrace cognitive apprenticeships in the workplace. Cognitive apprenticeships differ from traditional apprenticeships in that the goal of cognitive apprenticeship is to explain the *why* of the thought process behind the skill or knowledge transfer and may be the answer to solving the problem of the aging workforce.

The class format of the traditional apprenticeship is valuable because it can create bonds between classmates and can allow extra observation opportunities. The distinct advantage of traditional apprenticeship classes is that they develop their own behavioral norms and culture, which translates into a learning culture. Collins, Brown & Holum (1991) state:

It is not uncommon for apprentices to have access to several masters and access to a variety of mod-

els of expertise. Such richness and variety help him understand that there may be multiple ways of carrying out a task and to recognize that no one individual embodies all knowledge or expertise. And finally, learners can observe other learners with varying degrees of skill; among other things, this encourages them to view learning as an incrementally staged process, while providing them with concrete benchmarks for their own progress.

## Traditional Versus Cognitive Apprenticeships

Traditional apprenticeships have been successful for centuries because a worker learns how to do the work and applies what is learned. By learning in teams, the apprenticeship classes can see skills development in action.

Operations management, engineering management and many other leadership positions do not take advantage of the traditional apprenticeship format because the format would not make sense without the cognitive aspect. Paul (2012) explains:

Like a traditional apprenticeship, this form of training pairs a rookie with a worker who's far more advanced, but Collins and his colleagues adapted the older custom to the new needs of executives, managers, salespeople and other professionals who work with their heads rather than their hands.

There is an opportunity to bring cognitive apprenticeships into the workplace to fulfill the gaps that are occurring, wherein most labor is not manual in nature. Collins (2006) stated the two differences between cognitive apprenticeship and traditional apprenticeship as:

1) Traditional apprenticeship was set in the workplace, which limits what the student could learn (because it can only teach what was pertinent and applicable to a workplace). Cognitive apprenticeship differs in that the tasks, challenges and problems are chosen to illustrate the effect of certain techniques and methods. This provides the learner with practice in applying them in diverse settings, not just direct application. As time goes by, the complexity grows so that the new skills can be put into practice and sequenced to "reflect the changing demands of learning" (Collins, p. 48).

2) Traditional apprenticeship emphasizes teaching skills in the context of their use, for direct application purposes, whereas cognitive apprenticeship emphasizes generalizing knowledge so that it can be transferred and used in various settings and "articulating the common principles, so that students learn how to apply their skills in varied contexts" (Collins, p. 49).

Apprenticeship should be valued for its history and dominance in the psychomotor domain. Through construction trades to early medical practice, apprenticeship has been the relevant method of learning. The value of apprenticeship

can become greater in the cognitive world, especially when the stakes are so high for information-based organizations.

Per Collins, et al. (1991), teachers must take three steps to translate the traditional apprenticeship model to cognitive apprenticeship: 1) make thought processes visible to students; 2) make the work relevant; and 3) allow the students to transfer what they learn by showing the common aspects of the process.

The key factor in implementing cognitive apprenticeships in the workplace is willing teachers and learners who can develop open communication. There is a potential challenge if the mentor or teacher role is not fully diversified. It is essential that novices have various mentors so that they learn how different mentors think and act. Being surrounded by experts will allow the novices to have a wide breadth of experiences in problem solving.

## The Methodology of Cognitive Apprenticeship

As baby boomers leave the workforce, significant employment holes open due to a lack of qualified workers. If an organization truly wants to ensure that it is not left spinning its wheels and asking retirees to return to the workforce, the organization should develop a plan to address cognitive apprenticeship before its baby boomer workforce leaves.

By engaging the mentor group (the baby boomers), organizations can prevent what could be catastrophic business losses due to a lack of knowledge transfer. It is essential that knowledge that is not written down procedurally (tacit knowledge) be transferred through cognitive apprenticeship.

Cognitive apprenticeship offers several teaching methods that baby boomers could use with novices in mentoring:

1) **Modeling:** meaning the demonstration of the temporal process of thinking.

2) **Explanation:** explaining why activities take place as they do.

3) **Coaching:** meaning the monitoring of students' activities and assisting and supporting them where necessary.

4) **Scaffolding:** meaning support of students so that they can cope with the task situation. The strategy also entails the gradual withdrawal of teacher from the process, to enable the students to manage on their own.

5) **Reflection:** the student assesses and analyses his performance.

6) **Articulation:** the results of reflection are put into verbal form.

7) **Exploration:** students are encouraged to form hypotheses, to test them, and to find new ideas and viewpoints. (Enkenberg, 2001, p. 503)

Essentially, using this methodology allows the mentor to explicitly show the learner why the mentor thinks a certain way or performs a certain action. The novice must learn what triggers the mentor's mind into ac-

## The Utility Connection

---

tion. Being able to articulate clearly and effectively is a needed trait of the mentor. Being able to ask questions freely, without fear, is a much-needed trait of the learner.

Modeling is usually thought about in the common, psychomotor context wherein someone models a behavior and the learner imitates that behavior. Modeling tacit knowledge involves actively discussing a thought process aloud with a mentee, allowing the mentee to learn the why of the decision-making progression. Coaching occurs when a mentee demonstrates a skill or a thought procedure. The mentor will observe and provide support to the novice, as needed. Careful coaching can provide the novices with confidence in their newly learned skills and abilities, which will also further the trust in their relationship.

During modeling and coaching experiences between the mentor and the novice, a “trick of the trade” is most likely learned. Collins et al. (1991) explains heuristic strategies:

Heuristic strategies are generally effective techniques and approaches for accomplishing tasks that might be regarded as “tricks of the trade”; they don’t always work, but when they do, they

are quite helpful. Most heuristics are tacitly acquired by experts through the practice of solving problems. (p. 13)

Learning heuristic strategies may save an individual or organization significant amounts of time and money. Learning lessons the easy way is a sure-fire way to make new employees’ jobs more enjoyable and profitable. Coaching is an important task for the mentor because it has the potential to provide a valuable amount of information to the novice.

Scaffolding is the help that a mentor provides during the novice’s skill execution, whether it is psychomotor or cognitive. Collins, et al. (1991), describe scaffolding as:

... supports the teacher provides to help the student carry out the task. These supports can take either the forms of suggestions or help, as in reciprocal teaching, or they can take the form of physical supports, as with the cue cards. (p. 14)

As the learner becomes more independent and competent in a newly learned skill set, the teacher can pull



# The Utility Connection

---

the scaffolding back and allow the learner to be “on his/her own.”

Reflection and articulation go hand in hand. While I reflect, I often articulate to myself. It would be advantageous for mentors to model for novices how they reflect, through articulation. Reflection can be challenging for individuals, especially if they are new to the exercise. After learning how to articulate their reflection, novices should be encouraged to explore new ideas and ways to improve. Eventually, the learners will be able to ask questions that even their mentors cannot answer, and that should be a goal of the learning process. Meaningful encounters between mentors and learners will foster a learning environment that is welcoming in the workplace. It is essential that the mentor teaches the learner to be the “expert.”

Prior to beginning a cognitive apprenticeship program, an organization must evaluate its resources and needs. Depending on the level of skills and knowledge needed to become an expert in a field, the organization must know how much time an apprentice will need with a mentor. If a learner needs 2 years with a mentor and the mentor is retiring sooner than that, you leave the program uncompleted and the learner ill prepared to perform his/her job duties.

Another issue that affects all humans at the psychological level is ego. If a mentor feels that s/he is invaluable and does not want to transfer knowledge to a novice, a cognitive apprenticeship program will not be advantageous for anyone involved. The mentor will be cold, unwilling to share and disengaged. The learner will be frustrated and lack the skills necessary to perform the job.

Thus, the organization must keep a mentor’s level of motivation high during the cognitive apprenticeship exercise. If the mentor is jaded or has a bad attitude toward work, that sociological perspective will transfer, perhaps more easily than other skills, to the novice. This will facilitate or continue a trend of poor culture in the workplace.

Mentor selection is a key process in making a cognitive apprenticeship program valuable. Not only must the mentor have the right amount of time available and the proper attitude, s/he also needs to have the proper skill set. If a mentor was historically part of a team and s/he did not perform up to standards, an organization would not want that person instilling knowledge and values into new employees. It is essential that the organization function on a high-performing level.

One way to gauge how the organization handles employees is through its performance management process. If the organization has an underdeveloped or underutilized performance management system, there is no true way to ensure that mentors are high performers at the expert level. Choosing appropriate employees to em-

brace the mentor role, then managing their abilities and skills at the facilitative level will be the most challenging aspect of creating a cognitive apprenticeship program in the workplace. Providing a structure and a clear set of expectations for both the mentor and the apprentice is essential to striking the right balance between the informal and formal aspects of the program. By allowing the learners to have multiple mentors, there is a less chance of failure between the mentor and novice relationship.

## Conclusion

Implementing cognitive apprenticeship programs provides both opportunities and challenges for organizations. Cognitive apprenticeship is an effective way to pass along knowledge that cannot be listed in procedural documents, knowledge that is tacit or heuristic in nature. This valuable, tacit information has a pathway to stay within the organization if the apprenticeship program is properly applied.

A significant challenge for the organization rests within the facilitative end of the cognitive apprenticeship program, due to resources, negative attitudes, and potential skill level deficits. Properly evaluating and selecting mentors prior to beginning a cognitive apprenticeship program can prevent challenges from occurring. While the workforce continues to age, it is essential that organizations choose to embrace cognitive apprenticeship before their resources disappear. ■

## References

- Collins, A. (2006). Cognitive apprenticeship. In K. Sawyer (Ed.), *Cambridge handbook of the learning sciences* (pp. 47-60). New York, NY: Cambridge University Press
- Collins, A., Brown, J.S. & Holum, A. (1991). Cognitive apprenticeship: Making thinking visible. *American Educator*, 15(3), 6-11, 38-46.
- Enkenberg, J. (2001). Instructional design and emerging models in higher education. *Computers in Human Behavior*, 17, 495-506.
- Paul, A. (2012, Aug. 11). Cognitive apprenticeship: The best way to learn on the job. Retrieved from <http://www.forbes.com/sites/anniemurphypaul/2012/08/11/cognitive-apprenticeship-the-best-way-to-learn-on-the-job/>
- Smith, V. (2013, March 21). U.S. mining, energy sectors face workforce shortage. Retrieved from <http://bigstory.ap.org/article/us-mining-energy-sectors-face-workforce-shortage>

**Jessica Richardson, M.S., CSP, CET, CHST, OHST**, is a safety professional for Pacific Gas & Electric Co.’s corporate safety department and an adjunct professor of industrial safety and quality program leadership at California Polytechnic State University in San Luis Obispo, CA. She also is an Volunteer Advisory Committee member of ASSE’s Utilities Practice Specialty.



Network on  
LinkedIn



Find us on  
Facebook



Read  
ASSE's blog

- Utilities Information
- International Resource Guide
- Journal of SH&E Research
- Networking Opportunities
- *Professional Safety* Journal
- Publication Opportunities
- Volunteer Opportunities



Search our  
knowledge base



Follow us on  
Twitter

When you see this symbol,  
click it to learn more



## The Utility Connection • Utilities Practice Specialty

### Officers

#### Administrator

Connie L. Muncy, CIH, REM  
cmuncy0764@gmail.com

#### Assistant Administrator

Michael K. Carter, CSP  
mkcarter@tva.gov

#### Content Coordinator

Michael K. Carter, CSP  
mkcarter@tva.gov

#### Assistant Content Coordinator

Jenniffer Zillmer  
jennifferzillmer@alliant  
energy.com

*The Utility Connection* is a publication of ASSE's Utilities Practice Specialty, 520 N. Northwest Highway, Park Ridge, IL 60068, and is distributed free of charge to members of the Utilities Practice Specialty. The opinions expressed in articles herein are those of the author(s) and are not necessarily those of ASSE. Technical accuracy is the responsibility of the author(s). Send address changes to the mailing address above; via fax to (847) 768-3434; or via e-mail to customerservice@asse.org.



### ASSE Staff

#### Manager, Practice Specialties

Charlyn Haguwood  
chaguwood@asse.org

#### Communications Team

Tina Angley  
Cathy Baker  
Rachel Metea  
Sue Trebswether  
COPSpublications@asse.org