CLE RESEARCH BRIEF

Cognitive Apprenticeship

1 What is it?

Cognitive apprenticeship is an instructional pedagogy, solidly grounded within the framework of situated cognition, that describes a process of learning in which a person with expertise in a given skill (referred to as a "Master") will teach that skill to a person without the same level of expertise (referred to as an "Apprentice) (Brown, Collins, & Duguid, 1989).

Brown, Collins, and Duguid (1989) make the observation that up until the beginning of the 20th century, apprenticeship was the most common means of learning, used to transmit the knowledge required for expert practice in fields from painting and sculpting to medicine and law. The term "Cognitive Apprenticeship" emphasizes two things. First, these methods are aimed primarily at teaching the processes that experts use to handle complex tasks. Second, the term "cognitive apprenticeship" refers to the fact that the focus of learning-through-guided-experience is on the cognitive and metacognitive, rather than on physical, skills and processes. (Collins, Brown, & Newman, 1987, pg 2).

This pedagogy posits that learning is a function of the context in which it takes place, the tools in the context, and the social interaction between the master (the educator) and the apprentice (the learner). The social interaction may include other learners and educators and at some point the apprentice may also become the master to a less-experienced learner. (Merriam & Bierema, 2014, pg).

The concept of a community forming the basis for cognitive apprenticeship, implied in the element of a "culture of expert practice" is also discussed by Brown, Collins, and Duguid (1989). Their research was later expanded by Hofer & Pintrich (1997) who indicated that the role of a student is to become part of a community of practice.

2 How does it work?

Apprenticeship embeds the learning of skills and knowledge in the social and functional context of their use (Brown, Collins, & Duguid, 1989, pg 1). Merriam and Bierema (2014) describe cognitive apprenticeship as a strategy or approach to make learning authentic.

Brown, Collins, and Duguid (1989) defined five characteristics critical to the effectiveness of learning inherent in cognitive apprenticeship:

1. *Situated learning*: Performing tasks and solving problems in an environment reflective of how the knowledge will be used in the learner's future.
2. *Culture of expert practice*: the creation of a learning environment in which participants actively communicate about, and engage in, the skills involved in the practice of solving problems and carrying out tasks within a domain.
3. *Intrinsic motivation*: creating learning environments in which students perform tasks because they are related to an interesting or coherent goal, as opposed to an extrinsic reason such as a good grade (Lepper & Greene, 1978).
4. *Exploiting cooperation*: students working together in a way that fosters cooperative problem solving.
5. *Exploiting competition*: A strategy of giving students the same task to carry out and then comparing what each produces, as a focus on revealing the sources of strengths and weaknesses.

Cognitive apprenticeship focuses on six teaching methods (Collins, 2006, as cited by Putica & Trivic, 2016); *Modeling, Coaching*, *Scaffolding*, *Articulation*, *Reflection*, and *Exploration.* These teaching methods are also frequently condensed into three concepts referred to as *modeling*, *coaching*, and *fading*; the master *models* a concept, *coaches* the apprentice, then *fades* away to allow the apprentice space to master the concept. (Collins, Brown, & Newman, 1987).

3 Who is doing it?

Cognitive apprenticeship is finding roles across a wide range of disciplines. The earliest study by Brown, Collins, & Duguid (1989) discussed cognitive apprenticeship for use in teaching mathematics. More recently, cognitive apprenticeship has been the basis of a theoretical framework for teaching courses ranging from general sciences (Ramdass, 2012) to music (Weidner, 2018) and health sciences (Lyons, McLaughlin, Khanova, & Roth, 2017).

Within the health sciences, a study in 2017 identified 104 articles covering the application of cognitive apprenticeship theory to teaching health sciences, with the majority published from 2009 to 2014. The educational settings ranged from clinical environments, online learning modules, simulations, and blended courses (Lyons, McLaughlin, Khanova, & Roth, 2017).

This pedagogical model is even finding use within the teaching community as a faculty development tool, to improve instructional design practices in the classroom (Stefaniak, 2018).

4 How effective is it?

Available research generally indicates that cognitive apprenticeship is an effective pedagogical model which generates measurable improvements in higher-order learning and knowledge transfer.

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Cognitive Apprenticeship

As one example; in a study on the effectiveness of using the cognitive apprenticeship model for mathematical problem-solving skills, researchers Chethana and Leonilla (2017) determined that teaching through a multimedia instructional approach, structured on the cognitive apprenticeship model, is more effective than conventional teaching methods in enhancing problem solving skills in mathematics among secondary school pupils who were both above and below the average.

While conducting research in web-based collaborative problem solving, researchers Fan-Ray, Hwang, Szu-Chuang, and Sherry (2012) reported that a review of literature revealed the cognitive apprenticeship model is generally able to improve the high-order thinking ability of students, a conclusion that applied from elementary school students to graduate students.

In a study conducted by Putica and Trivic (2016) in understanding the functionalization of oganic chemistry, the researchers reported the cognitive apprenticeship approach has the potential to promote transfer of the organic chemistry knowledge to the real-life situations, as opposed to the traditional approach which primarily focuses on the acquisition of pure academic content.

5 What are the implications for instructional design?

The cognitive apprenticeship model is based upon learning in authentic environments. The challenge for using cognitive apprenticeships as a learning model in an instructional design project is to offer simulations representing truly authentic learning challenges with a wide range of self-correction and learning, while not separating learning tasks from the social environment of the expert / apprentice that forms the core effectiveness of this model.

The basic question an instructional designer has to ask when determining authenticity is “For who are these tasks authentic?” (Petraglia, 1998, pg. 59). The risk when using educational technology is that the technology may reduce cognitive apprenticeships to just a couple of key elements that can be emulated with computer environments. Apprenticeships have less to do with the formal features of problem solving than the social environment in which learning occurs (Petraglia, 1998) .

Technologies that support cognitive apprenticeship have the ability to actually improve upon the traditional (i.e. vocational) apprenticeship model. The real-world model is inefficient in several respects, mostly because of the limitations of time and space that constrain apprentices working out in the world. Such apprenticeship leaves a lot to chance because learning only occurs in response to real needs that are in the workplace, so apprentices can only play the hand dealt them. Educational technologies can circumvent some of these limitations by creating learning contexts that are apprenticeship-like in several respects but offer more opportunities for self-correction and learning modification. However, Instructional designers must not lose sight of the ultimate power of learners to determine the authenticity of their task environments. (Petraglia, 1998)

Scenario

Case Study: Employing a Cognitive Apprenticeship to Improve Faculty Teaching

Faculties in colleges are often hired for their subject-matter expertise in specific disciplines, but may lack formal pedagogical training for a job that requires teaching skills. In a case study on improving classroom instructional design practices in the classroom, Stefaniak (2018) explored the effectiveness of using a cognitive apprenticeship framework.

The researcher worked with three instructors teaching an undergraduate-level introductory public speaking and communication theory course. None of these instructors taught any part of an online course and none had advanced degrees in instructional design. The study was conducted over a 15-week course semester. The study was conducted in three five-week phases.

In phase 1, the researcher worked with the instructors on identifying and selecting learner-centered instructional strategies that they could incorporate in their class. In phase 2, the researcher provided decreasing amounts of assistance to the instructors regarding the identification and selection of instructional materials. Faded coaching was intentionally used to promote learning and encourage learners to attend to designing instructional activities themselves. In phase 3, during the final five weeks of the semester the instructors were responsible for identifying and selecting instructional activities on their own without any additional guidance or support. The instructors were evaluated on their ability to independently implement learner-centered strategies without additional prompting or persuasion.

Although the results were overall successful, Stefaniak (2018) noted that it would have been beneficial to have more time to work with and observe the instructors. The researcher observed that there is a lack of literature on the appropriate amount of time designated for cognitive apprenticeships mainly due to the difference in tasks that have been taught using this framework.

Stefaniak’s (2018) conclusion was that the cognitive apprenticeship framework provides the scaffolding and support needed for teaching new or unfamiliar concepts to faculty while allowing them the flexibility, and reflective practice, to adapt content to meet the needs of their classroom.

Cognitive Apprenticeship

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