Visual Communications Journal

Fall 2019 Volume 55 Number 2

Teaching Like A Master: Implementing The Cognitive Apprenticeship Framework In Graphic Communications Laboratory Assignments

by Erica Walker, Ph.D. • Clemson University

VISUAL COMMUNICATIONS JOURNAL

VCJ

VOLUME 55 • NUMBER 2 FALL 2019

Acknowledgements

Editor

Dan Wilson, Illinois State University

Associate Editor

Gabe Grant, Eastern Illinois University

Cover Design

Madelyn Wieman, Western Technical College, LaCrosse, Wisconsin
Instructor, Kenneth Hey

Page Design, Formatting, and Prepress

Janet Oglesby, Can Le

Printing, Bindery, and Distribution

Harold Halliday, University of Houston
University of Houston Printing and Postal Services

About the Journal

The Visual Communications Journal serves as the official journal of the Graphic Communications Education Association, and provides a professional communicative link for educators and industry personnel associated with design, presentation, management, and reproduction of graphic forms of communication. Manuscripts submitted for publication are subject to peer review. The views and opinions expressed herein are those of authors and do not necessarily reflect the policy or the views of the GCEA.

Article Submission

Please follow the guidelines provided at the back of this *Journal.*

Membership and Subscription Information

Information about membership in the Association or subscription to the *Journal* should be directed to the GCEA Vice-President of Membership.

Reference Sources

The *Visual Communications Journal* can be found on EBSCOHost databases.

ISSN: Print: 0507-1658 Web: 2155-2428

GRAPHIC COMMUNICATIONS EDUCATION ASSOCIATION

GCEA Board of Directors

Teaching Like a Master: Implementing the cognitive apprenticeship framework in graphic communications laboratory assignments

by Erica Walker Ph.D. • Clemson University

Introduction

In many graphic communications programs, lab courses are one of the cornerstones to providing students with meaningful, hands-on learning experiences. Theoretical content taught during lectures is linked to laboratory assignments in order for the student to grasp how theory looks in practice. These lab-based experiences also integrate opportunities for students to practice 21st century skills such as problem solving, communication, and teamwork.

During lab demonstrations, instructors typically model the process while students observe. Then students perform the task on their own to complete a requirement for the course. Although this style of teaching is common in graphic communications lab courses and has characteristics found in educational frameworks, both instructors and students can benefit from the added structure and repeatability gained when intentionally applying a proven framework to courses and assignments.

There are many educational frameworks available, but the cognitive apprenticeship framework developed in the late 1980s is a natural fit for graphic communications lab courses. This framework is based in constructivist and cognitive learning theories and adapts time-tested methods used in traditional apprenticeships to the classroom setting (Collins, Brown, & Newman, 1989; Pieters & de Bruijn, 1992). Applying the cognitive apprenticeship framework to graphic communications courses provides structure to a course while leveraging the innate strengths of hands-on, lab-based educational experiences.

Literature Review

Educational frameworks provide several benefits when used to design and implement curriculum. They introduce an element of formality and structure which increases consistency and help ensure alignment of assignments with learning objectives (Rouvrais & Chiprianov, 2011; Rouvrais, 2012). Frameworks also provide a balance between formal and informal education helping to scaffold learning in a way that is predictable for students. Cognitive apprenticeship is an educational framework which updates the traditional apprenticeship model and is commonly used in several academic fields including nursing, engineering, and online education (Taylor & Care, 1999; Hilem & Futtersack, 1994; Walker, 2016).

Traditional apprenticeship pairs a master with a young person, called an apprentice, to learn everything necessary for successful entry into a specific line of work. This process enables masters to pass down not only the science of "how" to become proficient in the necessary tasks, but also important strategies such as industry specific ways to approach a complex problem and the terminology needed to communicate accurately within the field (Collins, Brown, & Holum, 1991). Some industries still rely on this approach of passing down knowledge to the next generation of practitioners. One modern example is the completion of a residency for doctors before they enter the medical field (Stalmeijer, 2015).

Many aspects of traditional apprenticeship carry over into the cognitive apprenticeship framework, but not all. Both types of apprenticeship require that learning takes place in a social environment and that the learner is instructed by someone who is more knowledgeable. While being guided by the more experienced instructor, the learner moves from observation to active participation in the task until the learner no longer needs regular instruction and can complete the task on their own (Dennen & Burner, 2008). Another similarity between the two types of apprenticeship is that learning begins with easier tasks which then diversify and become more complex as the student gains skills and confidence (Collins & Kapur, 2014).

Unlike traditional apprenticeship, cognitive apprenticeship focuses on teaching the cognitive and metacognitive (thinking about how to think) processes necessary to complete a task. In order to transfer these, the instructor must successfully make their thinking visible for the learner (Collins et al., 1991). To do this, both the instructor and the learner verbally share their thoughts while approaching and completing a task. A simplified example of this would be the song that is used by adults to teach children to tie their shoes. In the song, a bunny circles a tree and then pops up through the hole which helps children visualize the movements that adults think about and perform when tying their shoes. Small children are not the only ones who benefit when presented with information about how to think about a task. A student of any age can learn by observing, internalizing, and then practicing a complex task when provided with cognitive and metacognitive insight (Clancey, 1992; Collins et al., 1991).

Cognitive apprenticeship uses four principles when designing learning environments: content, methods, sequencing, and sociology (see Table 1). Content includes two main categories of knowledge, both necessary for gaining expertise in a field. The first is *domain knowledge* which includes facts and concepts related to the task. The second is strategies which includes three types of knowledge– *heuristic strategies* (techniques needed to accomplish a task); *control strategies* (general approaches to solving a problem); and *learning strategies* (the tools needed to continue learning new concepts, facts, and procedures related to the field after formal instruction has been concluded) (Collins et al., 1991; Stalmeijer, 2015).

Collins, et al. (1989) includes six methods for instructors teaching within the framework. The methods include modeling, coaching, scaffolding, articulation, reflection, and exploration. In the first three methods, modeling, coaching, and scaffolding, the instructor demonstrates (*models*) a task while students observe the process, then they *coach* and provide verbal feedback (*scaffolding*) to the student as they attempt the task under the observation of the instructor (Stalmeijer, 2015). During *articulation* and *reflection* students think about what they have accomplished and how they completed the task. *Articulation* provides a public opportunity to discuss the completed task and *reflection* encourages the student to evaluate different ways of approaching the task. During *exploration*, a student applies what they have learned to a new, related task (Collins & Kapur, 2014). Combining all of these teaching methods, instructors can scaffold students from initial observation through guided practice of the task and on to application of the new skills to a similar task with little to no additional guidance.

This framework sets out three criteria for sequencing content. Assignments need to start out simple and build toward more *diverse* and *complex* challenges. During the learning process instructors share how these smaller tasks fit together into a global skill by explaining *how the local task fits* within the context of the overall skill set.

Social characteristics of the learning environment are emphasized in the cognitive apprenticeship framework. Collins, et al. (1989) includes four characteristics of the environment: *situated learning* promotes students to learn in context by using realistic assignments; a

Table 1: Principles for Designing a Cognitive Apprenticeship Environment in the Classroom (Collins & Kapur, 2014)	
Content- Types of knowledge required for expertise	
Domain Knowledge	Subject matter specific concepts, facts, and procedures
Heuristic Strategies	Generally applicable techniques for accomplishing tasks
Control Strategies	General approaches for directing one's solution process
Learning Strategies	Knowledge about how to learn new concepts, facts, and procedures
Methods- Ways to promote the development of expertise	
Modeling	Teacher performs task so students can observe
Coaching	Teacher observes and facilitates while students perform a task
Scaffolding	Teacher provides support to help students perform a task
Articulation	Teacher encourages students to verbalize their knowledge and thinking
Reflection	Teacher enables students to compare themselves with others
Exploration	Teacher invites students to pose and solve their own problems
Sequencing- Keys or ordering learning activities	
Increasing complexity	Meaningful tasks gradually increasing in difficulty
Increasing diversity	Practice a variety of situations to emphasize broad application
Global to local skills	Focus on conceptualizing the whole task before executing the parts
Sociology- Social characteristics of learning	
Situated learning	Students learn in the context of working on realistic tasks
Community of practice	Communicating about different ways to accomplish meaningful tasks
Intrinsic motivation	Students set personal goals to seek skills and solutions
Cooperation	Students work together to accomplish their goals

community of practice provides an opportunity to evaluate different ways of approaching and completing a task; *intrinsic motivation* encourages students to develop individual goals towards a personal investment in continued learning; and *cooperation* when working in a team learning environment (Stalmeijer, 2015). These four characteristics of the cognitive apprenticeship learning environment mimic the post-graduation experience and provide practice of industry-based and 21st century skills.

In the 1980s and 1990s, educational researchers applied this framework across many disciplines including nursing, reading, writing, and vocational education (Collins et al., 1989; Futtersack, 1994; Hennessy, 1993; Taylor & Care, 1999). Today, cognitive apprenticeship is mostly used in medical education, the design of online learning environments, and in project-based engineering courses (Vanessa Paz Dennen, 2004; Walker, 2016; Walker, Boyer, & Benson, 2019). Although there is no research yet to support the use of this educational model in graphic communications courses, the cognitive apprenticeship framework could be a good option for developing lab-based courses in this discipline.

Example Applications in Graphic Communications Courses

The cognitive apprenticeship framework, when implemented in a laboratory classroom, provides structure for developing an effective educational experience that combines theory-based content with experiential learning. The following section shares two lab-based assignments developed with the cognitive apprenticeship framework for graphic communications courses in

a university program. By providing these assignments, it is hoped that other graphic communications educators might gain insights on how this framework could be incorporated into their own courses.

Example 1: Studio lighting for portrait photography

Content. For this assignment, students demonstrate mastery of the domain knowledge required for studio portrait lighting by individually capturing a human model in four common studio lighting setups including: Short, Broad, Butterfly, and Rembrandt lighting. Each of the required setups have recognizable lighting characteristics that can be identified on the face of the model when the lights are set up properly. After capturing the required setups and students are more comfortable using the lights, they are tasked to experiment with the lighting to capture additional "inspiration-based" portrait photographs. Throughout the assignment, students employ strategies used by portrait photographers including techniques for directing models within the frame, approaches to adjusting the lights when having difficulty attaining the required setup, and tips for finding additional resources needed to create the inspiration-based setups.

Methods. Before starting the assignment, small groups of students attend a demonstration with the instructor in the photography studio. The demonstration begins with the instructor modeling safety information, specifics about the studio equipment, and a verbal walk through of the assignment requirements. For the rest of the demo session, students work as a team to set up Short lighting and Broad lighting while the instructor coaches and scaffolds their work by asking questions that encourage them to articulate their thought process while also interjecting guidance and correction when necessary. At the end of the demonstration, students have a few minutes to reflect on what they learned, ask questions, and share any tips they discovered while working together. Next, students explore during individual studio time where they direct their own photography shoot to capture the required and experimental shots for the assignment. Instructor guidance is still provided when requested, but students are encouraged to apply what they have learned, experiment, and seek out additional help and resources as needed.

Sequencing. This assignment is situated towards the end of the photography unit within this course. In the beginning of the semester, students focus on basic manual camera settings and work towards artistic application of those settings. The early assignments rely on natural lighting or instructor-provided studio lighting. This assignment increases complexity within the unit as the students use controlled, studio lighting for the first time. Prior to this assignment, students are comfortable with manipulating the settings on their cameras and applying those earlier lessons on exposure settings is necessary for successful completion of this assignment. At this point they should be able to focus more on directing their model and controlling the studio lights, both of which are new skills. Following this assignment, students progress from studio portrait lighting to product photography lighting, and further diversify their controlled lighting skillset. Studio lighting is a localized skill that can be applied globally throughout the semester as students later move into a videography unit that requires formal, well-lit interviews.

Sociology. This assignment occurs in a situated environment, a photography studio, complete with professional grade lights, backdrops, and camera gear. The assignment requires that they not only capture studio portrait lighting, but do professional level Photoshop touch-ups. The post-production aspect of this assignment increases students intrinsic motivation as they grasp the value of capturing the best possible photograph in the studio to reduce the amount of time required for touch-ups in Photoshop. Although each student produces their own work for submission, they build a community of practice as they cooperate in small teams to accomplish the assignment.

Example 2: Screenprinting: Introduction to the process

Content. In this assignment, students get their first introduction to the screen printing process and complete a three-color t-shirt design job. Students work in teams of three and each student is responsible for all of the production steps for one of the three colors of the design. This allows every student to output their own film, add the emulsion, and expose their screen before printing their color alongside the team. Instructor-prepared artwork is used for this assignment to ensure consistency throughout the learning process. Domain content is

covered in lecture where the theories and steps relevant to the screen printing process are introduced. The lab project is broken into three parts: prepress, screen preparation, and printing. Each part begins with an instructor led demonstration which covers strategies such as different approaches for each part of the assignment and how to troubleshoot common obstacles.

Methods. The instructor models the three parts of the process for small groups of students. During the demonstrations, each student records detailed notes in their technical notebook. After the demo, the students are expected to perform this task on their own using these notes as a reference (coaching and scaffolding). After completing the project as a team, every student articulates the full instructions in a step-by-step "work instruction" format that details the process in their own words. This becomes part of their submission for the assignment and provides an opportunity for students to reflect on the effectiveness of their approach in comparison with their teammates. After successfully completing this group assignment, students then design and produce their own three-color screen printing job, completing this next project individually. This allows students to explore what they have learned and apply it to a fully personalized screen printing product.

Sequencing. This is the first time students learn about this process so they are exposed to the global process in lecture followed by localized skills broken into smaller steps in lab. This assignment is an introduction to screen printing and the complexity and diversity increase as they move towards the more advanced screen printing project that they complete individually.

Sociology. Although this process is scaled down from production-based tasks for the classroom, the assignment is situated by utilizing the same steps used in high output, professional screen printing. Since it is a group project, students must cooperate and form a good line of communication within their team and within the class community of practice. In a three-color job, if one teammate fails to properly execute their steps the entire final product will be negatively impacted. The notes students take during the demonstration are intended to be carried into future assignments and classes so that students can continue to refer to them throughout their time in the program. These "personal guides" are intended to be used as a baseline so that instructors in subsequent classes can assume that the student has proficient knowledge of the introductory tasks and that they are adequately prepared to move forward into more complex, higher level applications. Intrinsic motivation for capturing clear, thorough notes increases as students connect the value of their notes to having a reliable resource to refer back to.

Discussion

The cognitive apprenticeship model is a valuable tool for creating and delivering lab assignments within graphic communications courses. In fact, many instructors are already implementing aspects of the framework into their labs without realizing it. When done with greater intention, certain learning expectations can be structured and measured, especially those that combine domain content knowledge with 21st Century Skills such as teamwork, communication, reflection, and problem solving.

Developing course content with the cognitive apprenticeship framework or any framework should not be inflexible. Not every assignment fits into this framework and not all the principles of the framework should be applied to every assignment. Instead, the framework helps instructors purposefully combine strategic approaches with domain content. This framework is especially effective when instructors use language that encourages the development of a community of practice while emphasizing the value of reflectiing on their own learning experience.

Some instructors may not feel confident in modeling and coaching industry practices in their classes. In that case, consider bringing guest lecturers and alumni into the classroom and lab so that they can share current best practices with students. By providing guidance in advance to guests, they can focus their instruction on the principles of cognitive apprenticeship. Many classroom guests naturally have an apprenticeship mindset when interacting with students so the instructor provided guidance may only need to be minimal. There are also teaching and industry organizations such as Graphic Communications Educators Association (GCEA), PrintEd, SkillsUSA, Adobe Education Exchange, and others that provide additional guidance for assignments that are situated within industry best practices.

Conclusion

Incorporating the cognitive apprenticeship framework into graphic communications labs provides important benefits for students and instructors. The framework utilizes a hands-on, mentorship approach where domain content knowledge and strategies for success are woven together into the learning process. Students move from passively observing the instructor modeling the process to completing it on their own with a gradual reduction in instructor guidance. This encourages individual expertise to go beyond the recitation of facts and allows students to demonstrate a deep understanding of the process. Additionally, instructor feedback can be individualized since it is verbal and "just in time" (given when the student needs it the most). As students gain confidence with new skills, less instructor feedback is needed and students begin to help their peers. This encourages peer-to-peer learning and the formation of a community of practice within the classroom.

The two examples featured in this paper come from different courses, one at the freshman level and the other at the junior level, within a university-level graphic communications department. The implementation of this model is not exclusive to these two subject areas or a certain level of learner. In fact, a lab-based course is not even necessary for this model. Instructors have successfully applied it in lecture-based classes (most often when combined with a flipped classroom approach) and even in online courses. The two examples in this paper address how graphic communications lab assignments might incorporate the principles of the framework.

Opportunities for future research include development of curriculum across a broader set of graphic communications topics followed by studying the effectiveness of this approach from the instructor and learner perspectives.

References

Clancey, W. J. (1992). Representations of knowing: In defense of cognitive apprenticeship. *Journal of Artificial Intelligence in Education*, *3*(2), 139–168. Retrieved from http://cogprints.org/291

Collins, A., Brown, J. S., & Holum, A. (1991). Cognitive apprenticeship: Making thinking visible. *American Educator*, *15*(3), 6–11.

Collins, A., Brown, J. S., & Newman, S. E. (1989). Cognitive apprenticeship: Teaching the crafts of reading, writing, and mathematics. *Knowing, learning, and instruction: Essays in honor of Robert Glaser* (pp. 455-460). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Collins, A., & Kapur, M. (2014). Cognitive apprenticeship. In R. K. Sawyer & R. K. Sawyer (Eds.), *The Cambridge Handbook of the Learning Sciences* (2nd ed., pp. 109–127). Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9781139519526.008

Dennen, V. P. (2004). Cognitive apprenticeship in educational practice: Research on scaffolding, modeling, mentoring, and coaching as instructional strategies. *Handbook of Research on Educational Communications and Technology* (pp. 813–828). Retrieved from http://faculty.weber.edu/eamsel/Classes/Projects%20and%20Research%20(4800)/Teaching%20and%20Learning/Dennen%20(2004).pdf

Dennen, V. P., & Burner, K. J. (2008). Cognitive apprenticeship in educational practice: Research on scaffolding, modeling, mentoring, and coaching as instructional strategies. *Handbook of Research on Educational Communications and Technology*, *2* (pp. 813–828). New York, NY: Lawrence Erlbaum Associates, Inc. Retrieved from https://books.google.com/books?hl=en&lr=&id=GgCPAgAAQBAJ&oi=fnd&pg=PA425&dq=Cognitive+Apprenticeship+Model+Educational+Practice+Dennen+Burner&ots=A9W2CIO-r7&sig=RCAbJ5IYZefnSjppkKPxJKB8DME

Hennessy, S. (1993). Situated Cognition and Cognitive Apprenticeship: Implications for Classroom Learning. *Studies in Science Education*, *22*(1), 1–41. https://doi.org/10.1080/03057269308560019

Hilem, Y., & Futtersack M. (1994). An interactive learning environment based on the cognitive apprenticeship paradigm for design engineers using numerical simulations. In *Educational Multimedia and Hypermedia*. Vancouver, British Columbia, Canada. Retrieved from http://eric.ed.gov/?id=ED388257

Pieters J.M., de Bruijn H.F.M. (1992) Learning Environments for Cognitive Apprenticeship: From Experience to Expertise. In: Kommers P.A.M.,

Jonassen D.H., Mayes J.T., Ferreira A. (eds) Cognitive Tools for Learning. NATO ASI Series (Series F: Computer and Systems Sciences), vol 81. Springer, Berlin, Heidelber. Retrieved from https://doi.org/10.1007/978-3-642-77222-1_19

Rouvrais, S., & Chiprianov, V. (2011). Modeling and architecting educational frameworks. Retrieved from http://www.webmail.orbiter.cdio.org/files/document/file/103_paper.pdf

Rouvrais, S. (2012, April). Recognizing non formal learning experiences. In *Proceedings of the 2012 IEEE Global Engineering Education Conference (EDUCON)* (pp. 1-5). IEEE.

Stalmeijer, R. E. (2015). When I say … cognitive apprenticeship. *Medical Education*, *49*(4), 355–356. https://doi.org/10.1111/medu.12630

Taylor, K. L., & Care, W. D. (1999). Nursing education as cognitive apprenticeship: A framework for clinical education. *Nurse Educator*, *24*(4), 31–36. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/10647388

Walker, E. B. (2016). *Opportunities for Innovation: Game-based Learning in an Engineering Senior Design Course* (PhD). Clemson University. Retrieved from http://tigerprints.clemson.edu/all_dissertations/1805/

Walker, E. B., Matthew Boyer, D., & Benson, L. C. (2019). Using Studio Culture to Foster Epistemic Change in an Engineering Senior Design Course. *IEEE Transactions on Education*. https://doi.org/10.1109/TE.2019.2898151

Visual Communications Journal Submissions Guidelines

Submittal of Manuscripts

» All manuscripts must be received by the editor no later than **December 15th** to be considered for the spring Journal or by **June 15th** to be considered for the fall Journal.

» Submit papers and correspondence to: Gabe Grant <gjgrant@eiu.edu> or check www.GCEAonline.org for contact information for the GCEA Vice-President of Publications.

Types of Articles

» The *Visual Communications Journal* accepts four levels of articles for publication:

» 1. Edited articles are accepted or rejected by the editor. These articles are not submitted to a panel of jurors. The decision of the editor is final.

» 2. Juried articles are submitted to the editor and are distributed to jurors for acceptance/rejection. Juried articles are typically reviews of the literature, state-of-the-art technical articles, and other nonempirical papers. Jurors make comments to the author, and the author makes required changes. The decision of the review board is final.

» 3. Refereed articles are submitted to the editor and are distributed to jurors for acceptance/rejection. Refereed articles are original empirical research. Jurors make comments to the author and the author makes required changes. The decision of the review board is final.

» 4. Student articles are submitted by GCEA members and are accepted/rejected by the editor. These articles are not submitted to a panel of jurors. The editor's decision is final. Please be aware that poorly written student papers will be rejected or returned for editing.

Eligibility for Publication

» Members of the Graphic Communications Education Association, or students of GCEA members, may publish in the *Visual Communications Journal*.

» Those wishing to publish should join GCEA before submitting their paper for review.

Audience

» Write articles for educators, students, industry representatives, and others interested in graphic arts, graphic communications, graphic design, commercial art, communications technology, visual communications technology, printing, photography, or digital media. Present implications for the audience in the article.

Manuscript Form and Style

» Prepare manuscripts according to the APA style.

» Submit your paper in Microsoft Word format.

» Call out the approximate location of all tables and figures in the text.

» List your name, highest degree, affiliation, and title on the first page only. Article text should begin on the second page.

» Please proofread carefully before submitting.

Figures (Graphics)

» Number and write a caption for each figure. Include captions in a list at the end of your Word document.

» Screen captures should be as large as possible.

» Photos should be about 300 ppi to span one column (3-inches) or 2 columns (6.5-inches).

» Line art should be in a vector format.

» Tables will be formatted by the designer to fit in one column (3" wide) or across two columns (6.5" wide).

Tables

» Set up tables in separate Microsoft Word documents, one document for each table.

Publication and Format

» The *Visual Communications Journal* is published and distributed twice a year, in the spring and in the fall. Each article of the *Journal* is published online at www.GCEAonline.org. Provided there are at least 24 pages of content, the *Journal* will be printed and mailed to GCEA members.

Notice of Limitation

» Articles submitted to the *Journal* cannot be submitted to other publications while under review. Articles published in other copyrighted publications may not be submitted to the *Journal*, and articles published by the *Journal* may not be published in other publications without written permission of the *Journal.*