meiea ®

MUSIC & ENTERTAINMENT INDUSTRY
EDUCATORS ASSOCIATION

Journal of the
Music & Entertainment Industry
Educators Association

Bruce Ronkin, Editor
Northeastern University

A Focus on Robert Gagné's Instructional Theories: Application to Teaching Audio Engineering

David Tough
Belmont University

Introduction

The learning theories of Robert M. Gagné have made a lasting impression on the field of education, especially in terms of efforts in curriculum design. His contributions are now widely recognized and have been integrated into the education discipline's broad conception of ideas important to learning and instruction in several fields including the military, instructional design, the medical field, engineering, and leadership (Smith and Ragan 1996).

Gagné's major theories include his taxonomy of learning outcomes, conditions of learning, and his nine events of instruction. These theories are known more as instructional theories, as traditional learning theory is more behaviorist in nature. It is the job of instructional theory to elicit a set of rules on how changes in human performance come about. Gagné's instructional theories seek to arrange conditions of learning to provide for specific performance outcomes, which makes them more related to the field of curriculum design (see Figure 1) (Driscoll 2000).

This paper will apply Gagné's instructional theories, as well as other related theories, to a simple series of steps in teaching audio engineering in the college classroom.
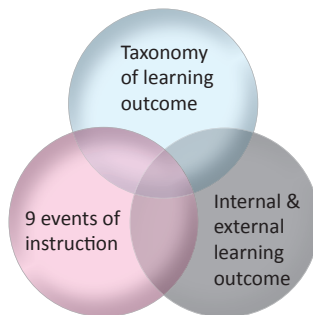

Figure 1. Relationship between Robert Gagne's instructional theories and models (Azahari 2010).

Background

The biographical information available on Gagné makes it clear that he was a focused scholar; as a teenager, he already knew he wanted to study psychology (Richey 2000). He grew up in Massachusetts and eventually attended Yale University on scholarship, pursuing the study of psychology (Richey 2000). After receiving his bachelor's degree there, he continued on to do his graduate work at Brown University and eventually received a Ph.D. in experimental psychology (Richey 2000).

In 1941, Gagné's work as a professor in Connecticut was halted due to World War II. He served in the military in a research capacity, gradually working his way up the ranks to become a second lieutenant (Richey 2000). He eventually went back to Connecticut and continued research there through a grant from the military, then took a position at the United States Air Force's Human Resources Research Center in 1949. After continuing to work in this and other military-affiliated research facilities, he became a psychology professor at Princeton University in 1958, with a focus on researching skills related to mathematics and problem-solving. Later he would be appointed to a position at the University of California Berkeley and author several books, including his collaboration with L. J. Briggs (Richey 2000). After a lifetime of contributing through research, publishing, and scholarship, Robert Gagné died in 2002 (Cooper 2005).

The Nine Events of Instruction

Gagné's contributions to education include several major theories of learning. One such theory is his "events of learning," or events of instruction, in which he stipulates the existence of nine learning events that are part of almost every learning outcome (Gagné 1985). These events, according to Gagné, can be used to guide the instructional efforts through a pre-ordained set of steps that meet learning initiatives (Gagné 1985). Put more simply, the instructor should be able to develop an effective lesson plan based on these nine steps. It is important to note that Gagné's theories focus on outcomes and behaviors in the instructional process and therefore have a tendency to side with a behaviorist-centered classroom approach.

The nine events of instruction begin with the event of *gaining the learners' attention* so that interest and curiosity can be sparked (Gagné, Briggs, and Wager 1992). Next, the instructor *states the objectives of the instructional effort* so that expectations of learning can be clarified and the importance of the lesson can be stipulated. The third learning event

is to *stimulate the learners' memories of previous related learning* so that meaning can be connected with the current efforts. Next, the instructor *sets out the new information* and describes the material, then *guides the learners through examples*, demonstrations, and efforts of discovery. The sixth learning event involves the instructors' *eliciting of performance* in which learners' demonstrate that they have gained and assimilated new information. After this the instructor *provides feedback* both to affirm correct interpretations of knowledge and to provide assistance in the case of misunderstanding. In the eighth event of instruction the educator *provides an assessment of learners' performance* to determine whether achievement of the goals has occurred, and finally the instructor *provides reinforcement of the learners' memories of new knowledge* through helping the students apply new information to concrete scenarios (Gagné, Briggs, and Wager 1992). The exact incarnation of these events is not something that can be specified in general for all lessons, but rather must be determined for each learning objective. The events of instruction must be deliberately arranged by the teacher to support learning processes (Gagné, Briggs, and Wager 1992).

Taxonomy and Conditions of Learning

Whereas the nine events of instruction are *externally* created by the instructor, Gagné's taxonomy and conditions of learning are the *internal* processes occurring in the student's mind. Each method of learning responds to a different external modality presented by the instructor and each signifies a unique manner of encoding information into long-term storage as well as retrieval and transfer to new situations (Gagné 1970, Ch. 4). To further clarify, the external conditions are the environment that the teacher arranges during instruction, while internal conditions are the competencies that the learner has already mastered or has the capability to master. Obviously, internal conditions of learning vary somewhat by the learning aptitude of the individual (Driscoll 2000).

The taxonomies of learning listed by Gagné (1970) include:

> *Signal Learning* – Here the individual learns to make a general, diffuse response to a signal. This is a type of associative learning that has been initially studied by Ivan Pavlov who has called it the "conditioned reflex." Much of the initial learning of early childhood is signal learning.

However, as adults most of this type of learning occurs unconsciously.

Stimulus-Response Learning – The learner acquires a precise response to a discriminated stimulus. This learning was called "trial and error" learning by Edward Thorndike. Initial solutions to a problem are random, but subjects modify their approach in every attempt. Success is achieved with multiple attempts. In audio engineering, this would be akin to "pushing buttons" until one finds the correct button to accomplish the task.

Chaining – A chain of two or more stimulus-response connections is acquired. For example, in audio engineering, getting appropriate signal flow from the microphone to the tape recorder is a series of small steps that add up to a larger objective.

Verbal Association – Learning definitions of objects and concepts and then learning to chain those associations. What is a transducer? What is a microphone? What is a speaker?

Multiple Discrimination – Learning to distinguish between two or more stimulus objects or events.

Concept Learning – Learners acquire a capability of making a common response to a class of stimuli. They make several direct observations until the concept is reached. A concept category can be tested by a question such as "What type of mic is an SM57…dynamic or capacitor?"

Rule Learning – A rule is a chain of two or more concepts. For example, $V = I \times R$ is meaningless unless the student understands what the symbols V, I, and R stand for, and the concepts of volts, current, and resistance.

> *Problem Solving* – the process of problem solving is one in which the learner discovers a combination of previously learned rules that can be applied to achieve a solution for a novel situation. Most of us call this "critical thinking."

In this theoretical hierarchy, Gagné visualizes the start at signal learning, or prerequisite knowledge, which is required as a foundation for the second learning type of stimulus-response connections (Lawson 1974). Then, chains and verbal associations can occur, progressing through to discriminations and concepts, and finally arriving at rules and problem solving. For one to achieve any of the levels in the learning hierarchy, the level before it must have been mastered (Lawson 1974). The process of concept formation involves all eight processes and if learning has been skipped or not mastered at any previous level, there is perceptible deterioration at all higher levels (Gagné and Wigand 1970).

Applications – Teaching Audio Engineering

Gagné believed external learning environments could be constructed by working backwards from the final learning objective. The instructional goal is a combination of several individual objectives that are to be integrated into a comprehensive purposeful activity. When designing any type of curriculum instructors must constantly ask themselves, "What are the intellectual skills one needs to have mastered in order to learn the new objectives?" Answering this question will then facilitate the hierarchy of design, i.e., instructional sequencing (Driscoll 2000).

Gagné realized that learning is a co-creation between the learner and the learning experiences. The instructor must create an environment where learners have a good chance of creating new pathways in their brains (Graff 2006). It is widely known that lecturing is the dominant method of teaching on college campuses (McKeachie 2002). However, McKeachie (1986) found on average a student can recall 70% of the information presented in the first ten minutes of a lecture and only 20% of the information presented in the final ten minutes. Griffiths, Oates, and Lockyer (2007) suggest that the retention rate is much higher when the engagement and involvement in learning is high. An example of this would be to engage learners in a practical task rather than simply reading the task procedures. In this type of classroom, the instructor acts as a facilitator who increases student motivation and learning through sharing and self-development.

The incorporation of Gagné's nine learning events allows the college-level instructor to do just this—develop a curriculum design that is instructor-facilitated and uses multiple modalities for effective retention. This lesson design should provide an effective external learning environment (stimuli that is presented externally to the learner) as well as touch on the internal taxonomies of learning (cognitive capabilities of learner) mentioned above.

The example used for this scenario will be my instruction of sophomore students in a basic college audio engineering course (see Table 1). My goal for the students in this exercise is to apply basic studio microphone techniques to record an acoustic instrument.

The first learning event in Gagné's theory is to *gain the learner's attention*. In a recording education setting, I typically begin with a humorous photo. I sometimes use the "more cowbell" Will Ferrell photo from the famous *Saturday Night Live* skit. Most students are familiar with this pop culture skit and begin laughing. This type of tool echoes the research of those such as Allan Paivio, who showed that visuals can provide the brain with much more than simple words can (Graff 2006). The most important point is that I have and maintain their attention. I then show quick visuals of several different miking techniques used by famous bands and engineers. The students realize that professional audio engineers have been trained in the techniques on which they are about to be taught. They now feel that they must know this equipment in order to gain professional status and ultimately, employment. Gagné realized that if the learning content isn't personally motivating to the learners, the audience's attention cannot be kept, even if the learners are personally motivated. The instructor in a recording technology environment curriculum should give the students reason for why they should care about learning the topic.

After the laughter and awareness has diminished, I quickly cover step two, *identify the objective*, by giving students a one-page handout showing the instructional goals of the assignment as well as the specific steps needed to achieve these goals. The handout states, "After completing this lesson the students will be able to understand the steps required for choosing the right type of microphone, how to place microphones in a studio setting, and how to properly document the results." They now know what the focus of their learning will be for this class.

Gagné's third event of instruction is to *stimulate prior learning memories*. For this, I refer back to concepts related to the differences between

Event of Instruction	Purpose	Classroom Activities
1. Gain attention	Activates the receptors with the use of stimuli	Humorous or interesting visual shown to capture student's attention. Then show quick visuals of several different miking techniques used by famous bands and engineers.
2. Inform learners of objectives	Create the sense of expectation for learning	Give a handout at beginning of class summarizing activities and goals for this class.
3. Stimulate recall of prior learning	Retrieve and activate the information stored in short-term memory	Question students on learning from their prior courses and experiences to stimulate prior knowledge.
4. Present the content	Create or increase the selective perception of content	Instructor shows his or her technique to class.
5. Provide learner guidance	Encode the information semantically into the storage of long-term memory.	Instructions written on whiteboard and materials are laid out to clarify and organize the information.
6. Elicit performance	Respond to questions to further enhance encoding and ensure verification.	Students setup microphone in tracking room without the help of instructor. They also record microphone in control room on multi-track and listen to performance, making adjustments as they go along. All practices are tied to learning objectives laid out at beginning of class.
7. Provide feedback	Reinforce and assess the correct performance.	Instructor provides feedback on completion of the exercises within the tutorial. Also shows correct answer for incorrect attempts as learning reinforcement.
8. Assess performance	Retrieve and reinforce the knowledge or skills as the final evaluation.	Individual practical exam given to measure student retention and teaching effectiveness.
9. Enhance retention and transfer to the job	Retrieve and generalize the learned knowledge or skills to new situation or real environment.	Instructor reviews at end of class time. Shows classes variations on techniques learned to encourage further application exploration and interest in content.

Table 1. Gagné's (1977) nine events of instruction: teaching an audio engineering course.

types of microphones and how they are used. This information could have come from their previous recording classes or simply through their personal listening experiences. I may play auditory examples of miking techniques (i.e., popular records) the students have previously stored in their memory. I may also show pictures of miking techniques and ask the students questions about each technique based on their own experience.

For the fourth instructional event, *the presentation of content*, I go with the students into the tracking room and show them the microphone setup I chose for a particular instrument (most likely set up before class). The students may then ask me questions regarding the setup I chose. This provides an opportunity to fulfill Gagné's fifth event of *providing learning guidance*. I answer questions and more importantly, let them mirror the microphone setup on a new instrument (step 6, application).

During the *application* phase learners must be allowed to make mistakes. Gagné's theories state that when a learner figures out why certain techniques do not work it may be more effective than the instructor showing how things actually work. In other words, learners need to fail. Learners must have the hands-on experience by letting them *experience*—not just showing them or describing it to them (Graff 2006). It is important to note during these practical stages of learning that emotion, or affective learning, plays an important role. Most learners cue off that which they feel. In Gagné's model, emotional attachment is the key for transfer of the content to long-term memory. Personal stories related by the instructor can also increase emotional context and allow the learner to change the pacing from technical to emotional (like recording education) (Graff 2006). This is one of the reasons face-to-face instruction still has its place in music industry education.

At this point I attempt to fulfill Gagné's seventh learning event of *giving feedback*. From the tracking room I provide feedback, correcting students who improperly perform the procedure. Finally, I give a practical exam so that I can *assess student performance and learning*, which is Gagné's eighth event. Ultimately, it would be better for this to happen immediately after application, but I have found it impossible to test multiple students on the same day of instruction. Finally, I try to quickly and succinctly *review the information* that has been learned during that class period so that memory retention is enhanced. This is Gagné's ninth and final event of instruction. Each iteration of this nine-step ladder is designed to give students a meaningful payoff of learning and goal achievement.

Ideally, the "meaningful payoff" leads right into the next motivating goal (Graff 2006).

Conclusion

Robert Gagné's theories have greatly influenced contemporary efforts of curriculum design and more educators are moving towards frameworks such as his to develop student-centered learning modules. This can only lead to more effective instruction in disciplines where the curriculum and lesson plans are still developing such as music business and audio engineering. Further research should be done on the effectiveness of implementing these models in classroom.

References

Azahari, Maz Azleena Binti (2010). "Gagné's Theory of Instruction." Retrieved from the ERIC database.

Campos, Tracy (1999). "Gagné's Contributions to the Study of Instruction." Retrieved from the ERIC database.

Cooper, S. (2005). "Robert Gagné." *Learning theories web*. Retrieved March 17, 2012 from http://www.lifecircles-inc.com/gagne.htm.

de Jong, J.A.S., R.F.A. Wierstra, and J. Hermanussen. "An Exploration of the Relationship Between Academic and Experiential Learning Approaches in Vocational Education." *British Journal of Educational Psychology 76* (2006): 155-169.

Driscoll, M. *Psychology of Learning for Instruction.* Boston: Pearson, 2005.

Fields, D. (1996). "The Impact of Gagné's Theories on Practice." *Proceedings of Selected Research and Development Presentations at the 1996 National Convention of the Association for Educational Communications and Technology*. Retrieved from the ERIC database.

Gagné, R. M. and V. K. Wigand. "Effects of a Superordinate Context on Learning and Retention of Facts." *Journal of Educational Psychology* 61, no. 5 (1970): 406-409.

Gagné, R. *The Conditions of Learning and Theory of Instruction*, 4th ed. New York: Holt, Rinehart, and Winston, 1985.

Gagné, R., L. J. Briggs, and Wager. *Principals of Instructional Design,* 4th ed. Fort Worth, Texas: Harcourt Brace, 1992.

Gagné, R. and K. L. Medsker. *The Conditions of Learning: Training Applications*. Fort Worth: Harcourt Brace College, 1996.

Graff, James. "Crash Course in Learning Theory." Retrieved March 17, 2012 from http://headrush.typepad.com/creating_passionate_users/2006/01/crash_course_in.html.

Griffiths, Gary, B. J. Oates, and M. Lockyer. "Evolving a Facilitation Process towards Student Centered Learning: A Case Study in Computing." *Journal of Information Systems Education* 18, no. 4 (2007): 459-467.

Killpatrick, L. (2001). "Gagné's Nine Events of Instruction. *Encyclopedia of Educational Technology*. http://coe.sdsu.edu/eet/Articles/gagnesevents/index.htm.

Lawson, T. "Gagné's Learning Theory Applied to Technical Instruction." *Training and Development Journal* 28, no. 4 (1974): 32-40.

McKeachie, W. J. *Mckeachie's Teaching Tips: Strategies, Research, and Theory for College and University Teachers,* 11th ed. Massachusetts: Houghton Mifflin Company, 2002.

McKeachie, W. J., P. R. Pintrich, Y. Lin, and D. A. F. Smith. *Teaching and Learning in the College Classroom: A Review of Literature*. Michigan: The University of Michigan, 1986.

Molenda, Michael (2002). "A New Framework for Teaching in the Cognitive Domain." *ERIC Digest*. Academic Search Premier Database.

Richey, R. C. (1996). "Robert M. Gagné's Impact on Instructional Design Theory and Practice of the Future." *Proceedings of Selected Research and Development Presentations at the 1996 National Convention of the Association for Educational Communications and Technology*. Retrieved from the ERIC database.

Richey, R. C. (Ed.). *The Legacy of Robert M. Gagné*. Syracuse, New York: ERIC Clearinghouse on Information, 2000.

Smith, P. L. and T. J. Ragan (1996). "Impact of R. M. Gagné's Work on Instructional Theory." *Proceedings of Selected Research and Development Presentations at the 1996 National Convention of the Association for Educational Communications and Technology*. Retrieved from the ERIC database.

David Tough is a Nashville-based educator, producer, engineer, songwriter and musician. He is an assistant professor of audio engineering at Belmont University in Nashville, Tennessee where he teaches audio engineering and production. Previous music industry teaching experience includes courses taught at Cal Poly Pomona, U.C.L.A., and the University of North Alabama.

Dr. Tough has worked on the business side of the industry for Capitol Records, Warner Chappell Music, BMG Music Publishing, and Capitol/EMI and has produced and engineered demos and master recordings for hundreds of artists worldwide over the internet from his website www.davetough.com.

Most recently in 2012 he had nine placements in the television show *Hart of Dixie* and had over ten placements in the CW television series *Remodeled*. In 2010 his song *Falling* was featured in Seth Rogen's *Observe and Report*. As a songwriter Tough has been a top finalist in many songwriting contests and he won the Grand Prize Country category in the 2009 John Lennon Songwriting Contest.

Tough is an active voting member of the Recording Academy and a member of AES.