Robert Gagnè and His Impact on Instruction

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Robert Mills Gagnè was an American psychologist who used his great mind and knowledge gained from his research intensive career to make significant contributions to the fields of training and instructional design. Gagnè's work bridged behaviorism of the 1950s and 1960s with constructivism of the 1970s and 1980s (Richey, 2000). His impact on educational technology remains apparent today in schools, military settings, and workplaces.

Gagnè's background and experiences laid the groundwork for his discoveries about learning and cognition. Gagnè was born in 1916 and grew up in North Andover, Massachusetts. He made the decision to study psychology before graduating from high school. He completed his undergraduate degree at Yale and his graduate work at Brown University where he was heavily influenced by the behaviorism theories of the day. His first job as a professor at Connecticut College for Women was cut short in 1941 when World War II caused him and many other Americans to be drafted into military service. He was soon assigned to Psychological Research Unit Number One at Maxwell Field in Alabama where he performed tests to select and classify aviation cadets. The urgent need for efficient, effective training during the war made empirical research a priority (Richey, 2000) and Gagnè gladly participated. After being commissioned as a second lieutenant, Gagnè continued his military career at the School of Aviation Medicine at Randolph Field in Texas where he continued combat aircrew testing. He was later transferred to the Perceptual Film Research Unit at Santa Anna Army Air Base where he conducted perceptual ability testing. He performed research at the Aero Medical Lab at Wright Field where he was part of an organization that initiated the study that later came to be known as human engineering (American Psychological Association, 1982). His military experiences were filled with research projects and observations about learning.

Once his military obligation was complete, Gagnè returned to the Connecticut College for Women as a professor. During this time, the Navy offered him a grant to research transfer of training in motor tasks, and he obliged. In 1949, Gagnè became the Research Director of the Perceptual and Motor Skills Lab of the Air Force Personnel and Training Center. He also served as an advisor to the Department of Defense. Later he became the technical director of training and research at the Air Force Maintenance Lab at Lowry Air Force Base in Colorado. His lab developed training requirements for newly developed weapons systems (American Psychological Association, 1982).

Gagnè's focus changed from military training to educational training during the 1950s. Americans responded to the Sputnik crisis with a demand for more math and science rigor in the schools (Richey, 2000). Gagnè took at job as a psychology professor at Princeton University in 1958. During this time, he helped develop "Science-A Process Approach" for the school system and also worked with University of Maryland in a math project for schools (Gagnè, 1968). In 1962, Gagnè became President of the American Institutes for Research where he was involved in human performance research and assessments. His first edition of *The Conditions of Learning* was published in 1965, and Gagnè participated in educational research while teaching at the University of California at Berkeley. His settling point became Florida State University where he became a professor in 1969. His principles of instructional design were developed during this time (American Psychological Association, 1982).

Although known for a research career that spanned over fifty years, Gagnè led an interesting personal life. He had an incredible memory and was known to have recalled a list of directions not previously seen for over a year and was able to quote a long poem like "The Raven" without hesitation years after it was first memorized (Richey, 2000). Gagnè's wife Pat

was a biologist and they had two children, Sam and Ellen. Gagnè liked to read modern fiction, and he liked to design and create furniture out of wood (American Psychological Association,1982). He was trusted and respected by his colleagues and peers. The man who devoted his life to research and learning died in 2002.

During his lifetime, Robert Gagnè made significant contributions to the theory of learning as well as the design of instruction. Over a hundred of his articles were published in various journals, and several books were written by him. Cumulative learning theory, learning hierarchies, domains of learning, the nine events of instruction, and conditions of learning are all credited to Gagnè. Gagnè respected the work of theorists before him and encouraged testing of his own theories as they were refined over time (Richey, 2005).

Behaviorism was the predominant learning theory in the 1950s and 1960s. Gagnè was influenced by the behaviorism or the view that all behavior stemmed from responses to environmental or external stimuli and could be explained without regard for internal mental states or consciousness (Richey, 2000). Gagnè theorized that behavioral learning resulted from the cumulative effects of learning, or the ordered set of capabilities which are built through differentiation, recall, and transfer of learning. He believed learning was a major causal factor in development rather than just a factor involved in adaptation (Gagnè, 1968). Gagnè then put cumulative learning into practice by developing learning hierarchies which were used to determine the appropriate content for instruction. The lowest level of the hierarchy was specific responses, followed by differentiations, followed by classifications, followed by rules, with cognitive behaviors being at the top level (Gagnè, 1968). The learning hierarchies reflected a shift from the focus on behavioral reinforcements to a focus on the nature of the behaviors themselves.

Learning hierarchies led to the development of Gagnè's five domains of learning. Each domain required a different type of instruction. *Motor skills* required physical practice. *Verbal information,* which consisted of facts, concepts, and procedures, required presentation with an organized, meaningful context. *Intellectual skills* required prior learning or prerequisite skills to be learned first. Identification of these prerequisite skills provided a basis for sequencing the instruction. *Cognitive strategies* required continual challenges to thinking that would need practice over time. *Attitudes* were taught best by a human model or by a very persuasive presentation (Gagnè, 1972). Gagnè later added a sixth domain of learning, called *enterprise*. This involved the integration of multiple objectives when pursuing a comprehensive objective purpose or enterprise. The single objectives, called schema, were integrated as part of the enterprise domain (Gagnè and Merrill, 1990).

After classifying the five learning domains, Gagnè theorized that different internal and external conditions were necessary for each type of learning to take place. This formed the basis of his book, *The Conditions of Learning*, which was first published in 1965. The Nine Events of Instruction were designed to provide the necessary conditions for learning and to serve as the basis for designing instruction and selecting appropriate media. The nine events were (a) gaining attention, (b) informing learners of the objective, (c) stimulating recall of prior learning, (d) presenting the stimulus, (e) providing learning guidance, (f) eliciting performance, (g) providing feedback, (h) assessing performance, and (i) enhancing retention and transfer (Gagnè, 1985). The events of instruction have seen continual widespread use in education and workplace training since 1965. Kevin Kruse, President of AXIOM Professional Health Learning and an e-learning consultant, said that "applying Gagnè's nine-step model to any training program is the single best way to ensure an effective learning program" (Kruse, 2006).

The success and long-term acceptance of Gagnè's theory comes from its systematic approach. Steps are laid out and are easy to apply and understand. His theory is practical and sensible and the instructional design has proven effective in providing the desirable learning outcomes for teachers time after time. His approach suits military training because it is procedural in nature and military tasks are usually well-defined. The Dick and Carey model of instructional design was heavily influenced by Gagnè's work and is used as a textbook for courses in instructional design today (Carey, Carey, and Dick, 2005).

A simple demonstration of how Gagnè's theories were applied to an instructional setting is provided in the following example. A teacher wanted her students to learn to make Gorp which stands for *good old raisins and peanuts*. He first gained their attention by showing the students a handful of Gorp and talking about how delicious it was. He then informed the students of the objective by saying, "today we will learn how to make Gorp." He took time for them to recall prior knowledge by asking if they had ever eaten Gorp. They discussed where and when it had been eaten and what it was made of. Next he presented the material and showed them how to make it. He guided their learning by using posters with the steps listed on them. He elicited the performance of the students by giving them the ingredients to make their own Gorp. He provided feedback by walking around and helping the students. Performance was assessed and the students were allowed to eat the Gorp if it was made correctly. Finally, he enhanced retention and transfer by asking them to make Gorp for a snack later that week. The teacher's lesson incorporated Gagnè's nine steps of instruction and satisfied the necessary conditions for learning how to make Gorp (Killpatrick, 2001).

Gagnè's theories have been easily applied to multimedia or e-learning applications as well. Eye-catching graphics and videos have been used as attention getters to start the learning

process. Gagnè and Reisner (1983) published a model showing how to select the best medium for instruction. Interactive media or programmed instruction was recommended to teach intellectual skills because students needed precise corrective feedback. Simulators were recommended for teaching psychomotor skills because of the need to practice in a relevant environment. Visual media was recommended for teaching attitudes because of the need for a human model (Untiedt, 2001).

Before Gagnè, the focus of instructional design was on the teacher or the teaching. Gagnè was instrumental in shifting the focus to the instruction itself. This shift opened the door to research on practice, feedback, sequence, and criterion-referenced assessments (Gagnè, 1988). As a result of instruction being emphasized, studies of the learner became more important and constructivist approaches to teaching became more acceptable. Gagnè's work provided a bridge between the behaviorist views and the more recent constructivist views which are primarily learner centered (Richey, 2000). Through experience as a military psychologist, a college professor, and a lifelong scholarly, empirical researcher, Robert Gagnè impacted the educational and training fields in a positive way by developing significant learning theories still applicable today.

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