

## Adopting Theories Underlying Directed Technology Integration Strategies: Study Objectivist Learning Theories

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### Abstract

*This paper examines key theories underlying directed technology integration strategies in education, focusing on objectivist learning approaches. The study reviews and analyzes several influential theories, including B.F. Skinner's behaviorism, Atkinson and Shiffrin's information processing model, Robert Gagne's conditions of learning, and systems theory approaches to instructional design. The analysis reveals how these theories provide conceptual foundations for technology integration in education. Behaviorism emphasizes reinforcement and observable outcomes. Information processing theory explains memory and cognitive processes. Gagne's work highlights conditions for effective learning. Systems approaches offer frameworks for designing technology-enhanced instruction. While each theory offers valuable insights, an integrated approach incorporating behaviorist, cognitive, and constructivist perspectives may be most effective for technology-enhanced learning. Understanding these theoretical underpinnings can guide educators in developing more effective technology integration strategies and creating optimal learning conditions in digital environments. This paper synthesizes key objectivist learning theories relevant to educational technology, providing a theoretical foundation to inform technology integration practices in modern education.*

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## 1. INTRODUCTION

Information and Communication Technology (ICT) is now in every aspect of life. ICT has transformed almost all business and government operations in the last two decades. It cannot be separated from the realm of education, where education is a highly socially-oriented activity. Good education has traditionally been associated with strong teachers and high levels of personal contact with students. As such, the use of Information and Communication Technology (ICT) in education is well suited for more student-centered learning settings. However, the role of Information and Communication Technology (ICT) in education is becoming increasingly important as the world moves towards digital media and information rapidly. This importance will continue to increase and grow in the 21st century (Shaheen et al., 2021). Technology in education includes not only the use of digital tools, but also how it can be used to enhance learning and teaching. This purposeful technology integration strategy is supported by various theories, which provide a conceptual foundation for the creation of an efficient and sustainable approach. (Hidayat & Khotimah, n.d.).

This article describes the theories underpinning technology-directed integration strategies, which include B.F. Skinner's behaviorist theory: a theory that explains the foundation for adaptive learning through interactive technology. Better learning outcomes can be achieved through the use of interactive learning software and media that involve active student participation. In addition, effective methods for measuring student achievement are positive incentive systems and continuous assessment (Ariandini & Hidayati, n.d.) Information-Processing Theory by Atkinson and Shiffrin: Much of the work of information processing theorists is based on the memory and storage model proposed by Atkinson and Shiffrin (1968), The memory and storage model proposed by Atkinson and Shiffrin (1968), which states that, like a computer, the brain has three types of memory or recall needed to process information, is the basis for much of the work of information processing theorists. Receptors-hands, mouth, nose, ears, eyes, and ears-receive sensory information. The information is lost or transferred to short-term memory (STM) or working memory after about one second. STM stores new information for 5-20 seconds. Information will also be lost unless it is processed or practiced

in a way that allows it to be encoded or transferred to long-term memory (LTM). Although LTM can store an unlimited amount of information, for new information to be transferred to LTM, it must be associated with prior knowledge already in LTM (Roblyer, M., & Doering, A. H. 2007).

On the other hand, the author will also explain the Cognitive-Behavioral Theory by Robert Gagne. According to Robert Gagne, learning is influenced by growth and environment, but the biggest influence is one's individual environment. Gagne has a view that learning is a change in behavior whose activities follow a hierarchy of abilities that can be observed or measured (Roblyer, M., & Doering, A. H. 2007). Lastly, System Theory and System Instructional Design: Educators analyze learning needs, set clear objectives, develop effective teaching techniques, and create relevant learning materials. This process includes activities such as lesson planning, teaching, testing, revising, and evaluating learning outcomes. Although behavioristic approaches emphasize observable behavior and reinforcement, it is important to consider other theories (such as cognitive and constructivist) to create a well-rounded learning experience (Mursidi, 2019).

## 2. THEORETICAL REVIEW

### 2.1 Behaviorist Theory of B.F. Skinner: Learning as Stimulus-Response Chains

Hergenhahn and Olson (2008) claim that B. F. Skinner, the third neobehaviorist, abandoned Hull's attempts to develop formal theories and went back to Watsonian concerns in order to base behavior observation alone as the basis for science. A pigeon or rat would receive food pellets as compensation for completing an exercise, like lifting its head over a line or pressing a lever, in an experiment designed by Skinner and called the Skinner box. According to Skinner's 1938 *Behaviour of Organisms*, a movement that receives this kind of reinforcement is strengthened and becomes more likely to occur, whereas a movement that receives this kind of punishment is weaker. A strategy that is chosen and sustained by its favourable outcomes; an action that is followed by repetition of that action. The operant was dubbed by Skinner. As a result, his method is called operant conditioning. People and animals exhibit particular behaviors as a result of the favourable outcomes of previous actions. According to Skinner, reinforcement plays a crucial role in learning. His approach involves capturing movement patterns that indicate the ways in which behavior is reinforced. He limits his scientific approach to the study of these movement patterns and stays away from discussing the development of habits or even stimuli (Ziafar & Namaziandost, 2019).

According to Roberts & Potrac 2024, stated that the operant conditioning theory of B.F. Skinner is very relevant when thinking about educational efforts. Cassidy et al 2016, added that Skinner's main area of study was the function of punishment and reinforcement and how they influence behavior. He also revealed, Skinner stated that a consequence such as the application of punishment causes an observable response such as a change in behavior. As a result, when a relationship is established between an action and its corresponding consequence, learning occurs whether the behavior is rewarded or punished. Groom et al 2016 and Schunk 2012 corroborate the argument that according to Skinner, activities are more likely to be repeated if they have reinforcing consequences because positive and negative reinforcement both seek to reinforce behavior. (Leeder, 2022).

### 2.2 Information-Processing Theory of Atkinson and Shiffrin: The Mind as Computer

The theory proposed by Atkinson and Shiffrin (1968, 1971) emphasizes the relationship between Short-Term Memory (STM) and Long-Term Memory (LTM). Long-term memory has two important advantages: first, the speed of forgetting STM is much lower than LTM (some psychologists even say that information in LTM is never lost even if we lose the ability to recall it), and second that LTM has unlimited capacity.

Incorporating new information into LTM remains difficult. Atkinson and Shiffrin suggest various controls that can be used to learn new information. One can acquire knowledge by using process control. Acquisition strategies include:

- a. Repetition, also called rehearsal, is repeating information out loud on a regular basis until it is successfully learned.
- b. Coding is the process of placing information for recall in the context of additional memorable information, such as mnemonic phrases or sentences.

- c. Imaging is the process of using visual images to make material easier to remember. This strategy for learning long lists or speeches was even suggested by the ancient Roman scholar Cicero (Aminah Rehalat, 2014).

### 2.3 Cognitive-Behavioral Theory of Robert Gagne: Providing Conditions for Learning

In his book, *The Conditioning of Learning*, Robert Gagne states that: Learning is a change in human disposition or capacity, which persists over a period of time, and which is not simply ascribable to the process of growth. Learning, according to Gagne, is a change in human ability caused by continuous learning, not just a process of growth. He believes that external and internal factors interact with each other (Bambang Warsita, 2008) and showed that learning is shaped by providing optimal conditions for learning. He developed the theory of learning conditions and nine teaching events:

- a. Attracting student attention: The instructor provides a stimulus to the class to guarantee that the material will be received. The teacher needs to capture the student attention before they can begin to digest any new material. This could mean making sudden adjustments to the instructions.
- b. Inform learners about the learning objectives: After the lesson, learners are given instructions for learners to do something, then learners are asked to tell the teacher the desired result.
- c. Reviewing previous learning: Students are asked to repeat the material given previously by the teacher.
- d. Presenting the stimulus: The teacher presents the material with unique things.
- e. Demonstrate performance: Students are asked to give feedback after the learning process by the teacher.
- f. Providing feedback: Students are given comments on their performance by the teacher.
- g. Performance evaluation: Teachers assign more tasks and provide feedback to reinforce learning.
- h. Enhancing retention and transfer: The teacher assigns a range of exercises to aid pupils in generalizing the knowledge (Martin, 2022).

### 2.4 Systems Theory and Systematic Instructional Design: Managing the Complexity of Teaching

This section describes the Systems Approach to Instructional Design (SAID), looking at some of its variations and assumptions underlying the historical strengths that have influenced its development so far. In the planning and implementation of learning activities, the systematic application of instructional design procedures and tools is a key feature of the Systems Approach to Instructional Design (SAID). This approach stems from the idea that instruction can be understood as a system consisting of logically interconnected factors such as the learner, teacher, materials, learning and learning environment, all working towards a common goal. The principles of behaviorism, a psychological school of thought that was prevalent when instructional theory was developed around 1950 and had a significant impact on theory and research on instruction, learning, and human behavior, reinforced this view of learning. Early SAID models emerged as a result of the behaviorists' emphasis on observable and measurable student outcomes, conducting pre-assessments of students before instruction began, presenting instruction sequentially, and using reinforcement to reinforce learning outcomes (Baba, N. M., 2016).

## 3. CONCLUSION

The article explores various theories underlying directed technology integration strategies in education, focusing on objectivist learning theories. Key theories discussed include:

1. B.F. Skinner's behaviorist theory, which emphasizes the role of reinforcement in shaping behavior and learning outcomes.
2. Atkinson and Shiffrin's information-processing theory, which compares the mind to a computer and explains how information is processed through short-term and long-term memory.
3. Robert Gagne's cognitive-behavioral theory, which views learning as a change in behavior influenced by growth and environment, following a hierarchy of observable abilities.
4. Systems theory and systematic instructional design, which involve analyzing learning needs, setting objectives, developing teaching techniques, and creating relevant materials.

The article concludes that by considering these theories, educators can create a well-rounded learning experience that incorporates behavioristic, cognitive, and constructivist approaches. This integration of various theoretical perspectives allows for the development of more effective and comprehensive technology-based educational strategies. The overall message is that understanding these

underlying theories is crucial for educators to effectively implement technology in their teaching practices and create optimal learning conditions for students in the digital age.

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