Culminating Experience Product #1: An Interdisciplinary Investigation of Effective Instruction

Bryn Hotes

COM 493-1: Capstone in Advertising and Public Relations

Professor Smith-Frigerio

April 13, 2025

Instructional design is an artistic science that attempts to find the balance between psychology, information, and design, aiming to educate audiences as effectively as possible. While curriculum and instructional developers work hard to elicit student engagement, comprehension, and immersion, today, many academic institutions in the United States are struggling to educate a large portion of the population effectively. Through the intentional employment of instructional design theories, design principles, and psychology, education developers may enhance current learning experiences to be tailor-made for their target audience. David Merrill describes instructional design as having two parts: technology and science. He explains that the technology side of the concept is about developing the tools, systems, and models that allow accessibility to students. He further articulates that the scientific part of instructional design is the effort to find ways humans learn best through experimentation and research (Merrill, 2004). Without either part of instructional design, lessons would not be crafted properly for their audience, either through inaccessible tools or confusing lessons.

### The History of Instructional Design

Although arguments concerning the origin of instructional design continue, many contend that it first formally appeared in 3000 BCE, establishing the first Sumerian temple schools (History Tools, 2024). These temples housed the earliest formal curriculum development, supported by numerous surviving academic tablets that priests, teachers, and students used to record planned curricula and lessons (History Tools, 2024). Although contemporary education has evolved to involve modern technology, academics, and theories, its roots remain in the Sumerian temple school's simple goals of academic success, trade mastery, and strengthening civilization. As humans continued honing curriculum development throughout the centuries, they have produced theories, principles, and tools tailored to the human brain, ever reaching for a more fine-tuned, engaging, and behavior-changing product.

Many argue that the earliest instance of systematic instructional design emerged in the United States during World War II, when developing mental uniformity, high behavior change, and herd obedience in the military was crucial (Reiser, 2001). With the aid of research-driven educators and psychologists, the United States developed training materials for the military. Leaders of the effort, including Robert Gagne, Leslie Briggs, and John Flanagan, significantly impacted the instruction's final product by implementing research and theories related to curriculum design, human behavior, and cognitive learning processes (Reiser, 2001). Their valuable aid also impacted the development of testing processes in training, nurturing a more cohesive and academically competent military (Reiser, 2001).

Following World War II, the Programmed Instruction Movement and Taxonomy of Educational Objectives, spearheaded independently by B.F. Skinner and Benjamin Bloom evolved instructional design. These developments increased the accuracy, directness of learning objectives, and specific student comprehension goals following training. Bloom's work developed into a contemporarily used framework, helping instructional designers ensure their lessons produce more than accurate recall but also student understanding, application, analysis, evaluation, and creation (Reiser, 2001). This model encourages deep learning that ultimately manifests into longlasting student behavioral change, the ultimate goal of instrAn excerpt from the Council on Foreign Relations report, U.S. Education Reform and National Security: The State of Education in the United States Today by Joel I. Klein, Condoleezza Rice, and Julia Levyuctional design. Additionally, the Criterion-Referenced Testing Movement, developed by Robert Glasier, recalibrated the definition of success in the classroom by adapting the definition of academic success, basing it on individual growth. An especially significant development in instructional design was Robert Gagne's The Conditions of Learning in 1965. Through this development, Gagne uncovers five domains of learning outcomes: "Verbal information, intellectual skills, psychomotor skills, attitudes, and cognitive strategies" (Reiser, 2001). Through technological advancement, instructional designers began to employ their methodologies in complex environments, primarily using computers, producing the first e-learning environments in the 1980s. Since then, a majority of instructional designs have focused on integration with online media, creating a more accessible environment while also neglecting the positive learning outcomes associated with physical learning.

# The Current State of Education: The Problem

, highlights the strengths and weaknesses of the U.S.' K-12 academic state in 2012, pronouncing the numerous public schools that are failing to educate students adequately. The authors note that U.S.

schools fail to prepare students for successful citizenship, a fast-paced and independent civilization, and the general workforce (Klein, Rice, Levy, 2012). They acknowledge the real problem in the U.S. educational system, the inequitable distribution of resources (Klein et al., 2012). They advocate for an actionable effort from policymakers to allow equal educational opportunity in the United States (Klein et al., 2012). This focus showcases a considerable challenge that cannot be resolved through proper instructional design but rather, policy change. The excerpt specifies that an alarming rate of high school students are unprepared for college, stating, "One recent report by the ACT, the not-for-profit testing organization, found that only 22 percent of tested high school students in the United States met "college-ready" standards in English, mathematics, reading, and science" (Klein, et al., 2012). Furthermore, the ACT states that only 3% of African American students were part of the 22% of college-ready citizens (Klein et al., 2012). These statistics demonstrate the unfair impact that students from low socio-economic communities feel. While the effectiveness of curriculum design cannot overcome this issue, increased accessibility to government-funded e-learning could benefit many students.

Furthermore, the report compares U.S. student performance to international student performance through the 2009 Program for International Student Assessment (PISA). The report details that the U.S., on average, falls short in high school academic achievement, especially in math and science (Klein et al., 2012). U.S. Secretary of Education Arne Duncan "Called the results "a wake-up call." He added, "I know skeptics will want to argue with the results, but we consider them accurate and reliable, and we have to see them as a challenge to get better" (Klein, et al., 2012). These insights serve as a primary example of the contemporary state of the U.S. education system. Through this, one may understand the importance of equitable and accessible student resources. Through the use of technology and asynchronous learning environments, instructional designers have an opportunity to resolve these inequities through the creation of open-source study materials.

# Psychology as the Foundation of Instruction

The successful development of effective, impactful, and engaging education must be foundationally based on the cognitive psychology of its target audience, addressing challenges including audience targeting, fair testing, and accurate course success analysis. Robert Glaser, a pioneer in instructional design, established the critical link between cognitive psychology and instructional design, spearheading commonly used modern concepts such as individually prescribed instruction (IPI), mastery learning, and testing as a tool. Glaser is a renowned scientist who famously believed that every student has the potential to be academically successful with the right lesson (Glaser, 1966). In his journal, *Psychological Bases for Instructional Design*, he states the importance of making instructional design based on psychological reasoning and research (Glaser, 1966). He provides a psychologically founded framework for successful instructional designers, including four steps: analyzing subject matter competence, diagnosing pre-instructional behavior, carrying out the instructional designers ensure relevant and accurate subjects, specific and psychologically informed objectives, an organized learning process, and a path to iteration. Glaser's concepts exemplify a scientifically founded version of audience research. By understanding an audience's prior knowledge and behavior, an instructional designer may create intentional lesson design, ensuring they touch on the correct topics, teach engagingly, test fairly, and analyze the course's results accurately.

### Datafication in Education

Datafication is a modern technique that helps teachers understand their students' psychology. Glaser emphasizes the importance of utilizing scientific data to understand one's audience. For example, if a teacher could track their class's engagement throughout a course in a learning management system (LMS), they would be able to adapt the activities and tests to suit their audience's preferences better, resulting in a more interactive audience. Sieglinde Jornitz and Laura C. Engel, established professors interested in data use, share that they find hope in classroom datafication use as it allows educators to make evidence-based decisions. However, they are also apprehensive of datafication, warning their audience of the possible surveillance and privacy violations it could create (Jornitz & Engel, 2021). Moreover, they illustrate their concern about the possibility that the use of data in the classroom could harm higher-level learning (analysis, writing, and engaged learning) as they are not easily quantifiable (Jornitz et al., 2021). The authors offer a benefit of datafication: using the collected data about U.S. schools and making international comparisons (Jornitz et al., 2021). This possibility would force policymakers to recognize the educational gap between the U.S. and other countries, encouraging further educational policy improvement. Through this action, U.S. public schools could become more equitable. While Jornitz and Engel's encouraging claims about the potential of datafication are possible avenues for increasing educational equity, data management must also be cautiously surveilled, ensuring student privacy. Moreover, with predatory data usage in the advertising industry, some may be concerned about how their data will be used. With recent unethical data crises, such as Facebook's most recent misuse of user data in 2018, audience members may be apprehensive about educational datafication (Newcomb, 2018). Moreover, concerns about inequitable targeting may arise as this system would only be employed in publicly funded schools. Therefore, the U.S. would be unethically exposing the majority of socio-economically less fortunate students to a significant privacy intrusion. One possibility to overcome this dilemma would be to require informed consent from each student in the integrated system, similar to the informed consent of a participant in a psychological trial. Through this solution, teachers would still have access to active, accurate, and constructive feedback while also considering the privacy and rights of their students. While this solution still holds space for the mishandling of data, as many Americans have experienced through Facebook or other social media platforms, it is a step in a consent-driven datafication direction.

# The Science Behind Learning

While employing modern technologies can create new opportunities in the landscape of accurate and intention-driven instruction, basing education in psychology remains a consistently successful approach that must be maintained. Molly Jameson, an accomplished educational psychologist at the University of Northern Colorado, explains the psychological learning process in her Psychology Today article, *How Do People Learn?* Jameson explains that learning occurs in four steps: encoding, consolidation, storage, and retrieval (Jameson, 2024). Encoding occurs when a learner either effortfully (studying/ reading) or automatically (instinctual action/ eating) processes information. Next, the student

begins the consolidation phase, crafting a cohesive story based on the processed information. The Storage process follows consolidation. This is when the learner works on something else or sleeps, maintaining the information in their long-term memory. Lastly, the student solidifies the learned information through retrieval. This step occurs most often during homework assignments or tests, as the student is asked to retrieve information without a reference.

#### Visual, UX, and UI Design in Instruction

Although some contend that instructional design is pure science, others propose the cognitive impact of color, typography, platform choice, and visual emphasis. Through the intentional employment of design principles, educational experiences properly guide students from one objective to another, smoothly educating the audience in an engaging and motivating fashion. Patrick E. Parrish, an academic researcher and instructional designer, discusses five design principles that help produce a more immersive and long-lasting learning experience. In his journal, Aesthetic Principles for Instructional Design, the researcher details the significance of employing intentional user experience and user interface design in all learning plans. This concept from his 2009 journal grows increasingly important as learning integrates with technology. Parrish details the five first principles of aesthetic instructional design, inspired by literary storytelling, the arts, and numerous creators, including Aristotle and John Dewey. Parrish explains that the five principles are plot, the learner as the protagonist, activity, context for immersion, and instructional designers as authors, supporting characters, and model protagonists (Parrish, 2009). He explains that by employing a literary storytelling approach in instructional design, authors may immerse their students in the lesson, easily guiding them through the lesson or, as Parrish defines it, the plot. He also explains that these principles align with current instructional design theories, including constructivism, activity theory, and cognitive apprenticeship (Parrish, 2009).

While the instructional designer's theories establish greater learner immersion and longevity, visual appeal is also critical. The *National Library of Medicine* contends that enhancing the visual appeal of educational experiences and integrating artistic activities within learning experiences can enhance cross-cognitive transfer as it encourages shared neural substrates, stretching one's brain across multiple

senses, processes, and functions. Through this, students improve parts of their brain used in academics. For example, the library claims that dancing or painting could impact academic performance by connecting different pathways. Given this reasoning, it may be corroborated that visual design, both through inactive design and active activity, could enhance students' longterm comprehension.

This concept is applicable to Allan Paivio's dual coding theory. This theory illustrates the importance of teaching verbally and visually to achieve academic success (Paivio, 1991). Paivio explains this by recognizing the two separate neural systems that process educational information, verbal and non-verbal. Many instructional designers also employ intentional multisensory learning, a way of teaching that reinforces memory through different sensory pathways by activating a student's senses (sight, sound, touch, etc.). Simple adaptations to instructional designs, such as typography, emphasis, contrast, imagery, and balance, can improve students' visual sensations, enhancing their overall educational experience.

#### The Solution and Conclusion

Through the culmination of psychological, design, and instructional methods, education development has the potential to be an intentional and culminating experience, resulting in a design tailored to the audience's neurology. Moreover, meticulously designing educational experiences ensures a high reception for diverse audiences, confirming that the curriculum remains accessible and effective. Historic examples have showcased the need for highly accessible learning materials. This includes deep audience research to understand their accessibility to tools like the internet and technology. Moreover, educators must weigh the pros and cons of datafication in the classroom. While some have concerns about privacy and the concurrent degradation of high-level learning, others contend that it empowers educators to actively tailor their courses and present sound evidence to policymakers who can affect educational equity, making instruction more equitable in the U.S.. Nevertheless, combining psychology and design principles creates a more engaging, immersive, and long-lasting learning experience. By implementing Dual Coding Theory, Multisensory Learning, the cognitive learning process, and applying aesthetic principles to instructional design, students will embark on a learning journey, immersing them in education and guiding them through the education process.

- Clark, J. M., & Paivio, A. (1991). Dual Coding Theory and Education. *Educational Psychology Review*, 3(3), 149–210. <u>http://www.jstor.org/stable/23359208</u>
- Glaser, R. (1966). Psychological Bases for Instructional Design. *AV Communication Review*, *14*(4), 433–449. <u>http://www.jstor.org/stable/30217331</u>
- Gropper, G. L. (2015). Inclusive Instructional Design: Creating a "Learner" Version of Instructional Design That Fosters Active Learner Engagement. *Educational Technology*, 55(3), 3–13. <u>http://www.jstor.org/stable/44430366</u>
- Ilie, M. D. (2014). An adaptation of Gagné's instructional model to increase the teaching effectiveness in the classroom: the impact in Romanian Universities. *Educational Technology Research* and Development, 62(6), 767–794. <u>http://www.jstor.org/stable/24546611</u>
- Jameson, M. (2024, February 28). *How do people learn*?. Psychology Today. <u>https://www.psychologytoday.com/us/blog/be-the-best-learner-you-can-be/202402/how-d</u> <u>o-people-learn</u>
- Jornitz, S., & Engel, L. C. (2021). The Management and Use of Data in Education and Education Policy: Introductory Remarks. In S. Jornitz & A. Wilmers (Eds.), *International Perspectives on School Settings, Education Policy and Digital Strategies: A Transatlantic Discourse in Education Research* (1st ed., pp. 223–241). Verlag Barbara Budrich. <u>https://doi.org/10.2307/j.ctv1gbrzf4.16</u>
- Klein, J. I., Rice, C., & Levy, J. (2012). The State of Education in the United States Today. In U.S. Education Reform and National Security (pp. 14–40). Council on Foreign Relations. <u>http://www.jstor.org/stable/resrep05781.8</u>

Merrill, M. D. (2004). The Science of Instruction and the Technology of Instructional Design. *Educational Technology*, 44(3), 45–46. <u>http://www.jstor.org/stable/44428908</u>

Newcomb, A. (2018, March 24). A timeline of Facebook's privacy issues - and its responses. NBCNews.com. <u>https://www.nbcnews.com/tech/social-media/timeline-facebook-s-privacy-issues-its-responses-n859651</u>

- Novak, J. D. (1981). Applying Learning Psychology and Philosophy of Science to Biology Teaching. *The American Biology Teacher*, 43(1), 12–42. <u>https://doi.org/10.2307/4447108</u>
- Parrish, P. E. (2009). Aesthetic Principles for Instructional Design. Educational Technology Research and Development, 57(4), 511–528. <u>http://www.jstor.org/stable/40388645</u>
- Reiser, R. A. (2001). A History of Instructional Design and Technology: Part II: A History of Instructional Design. *Educational Technology Research and Development*, 49(2), 57–67. <u>http://www.jstor.org/stable/30220311</u>
- Tracing the origins of education: Where did the first schools emerge?. History Tools. (n.d.). https://www.historytools.org/school/tracing-the-origins-of-education-where-did-the-first-s chools-emerge
- Wildman, T. M., & Burton, J. K. (1981). Integrating Learning Theory with Instructional Design. Journal of Instructional Development, 4(3), 5–14. <u>http://www.jstor.org/stable/30220644</u>