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Popular Instructional Design Models: Their Theoretical Roots and Cultural Considerations

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ABSTRACT

The digitalization of learning environments is changing the face of education. Learners from around the world have unprecedented access to online learning spaces in ways that were unthinkable even a few decades ago. Due to the growing diversity among digital learners, online learning spaces are becoming increasingly international and intercultural. To make e-learning offerings effective at meeting the needs of diverse groups of learners requires a better understanding of available instructional design models. This paper analyzes seven popular models and offers a series of recommendations that designers should follow to ensure that e-learning developed using these models is culturally inclusive.

Keywords: *instructional design models**;** ICT4E; ICT4D; e-learning; culturally inclusive design*

INTRODUCTION

The digitization of learning environments is having a profound effect on the contemporary landscape of education. From online degree programs to MOOCs to international development, digital learning programmes are steadily proliferating. The relative accessibility and portability of digital media has opened new learning spaces to strong global appeal. Learners from around the world can tap into and participate in these spaces in ways that were unthinkable even two decades ago. E-learning is one of the sub-categories within the broader framework of digital learning where "students interact with digitally delivered content, services, and support, often including a distant teacher" (Bloome & Chassy 2019).

The emerging frontier of e-learning has extended the global exchange of knowledge and ideas, and with it the possibility of meeting the needs of heretofore marginalized learners. In doing so, e-learning has the potential to contribute to the UN Sustainable Development Goal four, quality education ("UN SDGs" n.d.). Attention and resources are increasingly being directed towards educational technologies, which are viewed as tools for increasing educational access and quality.

For e-learning offerings to be effective at meeting the needs of increasingly diverse groups of learners, they need to be designed with cultural inclusion in mind. To accomplish this, the conversation needs to extend beyond the appropriateness of technology and content to also include the suitability of instructional design models. This paper analyzes seven popular instructional design models and surmises that none are currently adequate in addressing cultural diversity among learners. However, by applying a series of recommendations that can accommodate models with disparate philosophies and theories, designers are able to continue using popular models while creating e-learning that is culturally inclusive.

THE BLIND SPOT WITHIN ICT4E E-LEARNING PROJECTS

In the context of development, information and communications technologies for education (ICT4Es) have influenced all levels of learning, from pre-school to tertiary. Examples of e-Learning programmes include World Vision's early education programme for children, which aims to prepare 3- to 6-year-old Syrian refugee children to enter Lebanese schools (World Vision Lebanon 2016).

There is eSchool360 run by the NYC-based non-profit Impact Network, which provide technology, teacher training, and interactive curriculum to primary schools in Zambia. Amala (formerly Sky School) and Kiron use blended learning models to provide secondary and higher education access to refugees.

Other sectors of development have benefitted from digital learning innovation as well, including agriculture (Abdon, Raab, & Ninomiya 2008; Berge & Leary 2006); crisis and conflict settings (Rajab 2018; Rhema & Miliszewska 2012); economic development (Emerging360 2018; Setboonsarng & Zhang 2006); healthcare (Chang et al. 2012; Diedhiou, et al. 2015), and women's empowerment (Cherie Blair Foundation 2018; Hansson, Mozelius, Gaiani, & Meegammana 2010). These are only a few examples from a large and expanding field of ICT4D (information and communications technology for development) and ICT4E designed to reach a broad and international audience. The current interest and pace of growth does not seem to be showing any signs of slowing down.

When it comes to digital development projects, the principle of selecting appropriate technologies has become accepted, even expected. The need to understand a specific context and the need to design collaboratively with end users are also protocols that are becoming increasingly accepted. These criteria are put forth in the *Principles for Digital Development*, a set of best-practice guidelines created in consultation with several influential development organizations (Principles for Digital Development n.d.). Though not specific to education, a number of these principles can still offer helpful guidance on how to approach e-learning projects. USAID's Ten Key Principles for "conceptualizing, designing, and implementing ICTs in education systems" (Bloome & Chassy 2019, p.8) are specific to education, but they offer general guidance at the project-level rather than specifics about the design of e-learning.

One aspect of ICT4E that continues to be overlooked is the cultural dimensions embedded in e-learning design practices. Instructional design models are often falsely assumed to be value neutral. Subramony (2017) calls the lack of recognition within the instructional technologists community of issues of race, ethnicity and social justice - and, I would add, culture - a *collective blind spo*t and calls on us to "systematically transform [the field's] research and practice to more meaningfully confront issues of power, culture, equity, inclusion, privilege, hegemony, and oppression" (p.38). One step in addressing this blind spot and creating culturally inclusive e-learning opportunities is for designers to recognize and acknowledge the culturally formed epistemologies and theories embedded in the strategies and models being used.

THE SOCIOCULTURAL NATURE OF INSTRUCTIONAL DESIGN MODELS

Instructional Design Models (IDMs) are frameworks that offer steps and activities to create effective, efficient, and engaging learning experiences (Merrill 2013). They are more than simply popular or successful practices, a fact that is often overlooked. IDMs emerge from rigorous scientific research on how learning happens and what conditions lead to better learning.

However, although models are empirical, they are not neutral. Designing for e-learning in the context of international development - or within any context with an international or multicultural element, for that matter - necessitates the recognition that IDMs always contain bias. All models have deep sociocultural roots and reflect the values, beliefs, and practices of those who created them and the contexts in which they were created. These values and beliefs take the shape of *epistemologies*, that is, what we hold true about the nature of knowledge. Practices, in turn, take their shape from theories about how people learn. Design models also reflect cultural assumptions about instructors and learners, including assumptions about their respective characteristics and roles. To fully appreciate an IDM and whether it is appropriate to use in a given context requires an

understanding of the assumptions about culture and diversity that are embedded in it as well as the epistemological and theoretical foundations supporting it.

The Role of Culture in Learning and Instructional Design

Culture is a multi-faceted concept that touches on every aspect of our being. It encompasses both the philosophical and the practical, reflecting our deeply held values, providing "standards for deciding what is...what can be...how one feels about it...[and also] what to do about it, and...how to go about doing it" (Simpson, Gerard, Goodenough, & Inkeles 1961 p.522). Where there is collective consensus around standards and activities, there exists a mutual experience of culture that no longer belongs to the individual but also to the group.

Cultures, in all their varied forms, allow humans to connect with one another and make meaning out of activities and behaviors. Although cultures are human constructs, recent findings from cultural neuroscience indicate that cultural differences are reflected deep within the human neural circuitry. This suggests that cultural values and behaviors are sometimes beyond conscious awareness and choice (Chang 2017). Research shows that these differences affect cognitive processes including attention, focus, choice, motivation, and perceptions of self and others, and impact not only how individuals learn, but potentially how individuals from different cultures learn differently.

Culture has an important function in learning. The National Academies of Sciences, Engineering, and Medicine (2018) stressed that, "all learners grow and learn in culturally defined ways in culturally defined contexts...every individual's learning is profoundly influenced by the particular context in which that person is situated" (p.22). Therefore, culture shapes both the content of what we study and think (Boykin 1994) and our expectations around learning transactions themselves (Powel 1997). Cultural and social norms play a role in shaping learning and meaning-making processes, as well as the ways we digest information and display knowledge.

Culture also influences the design of learning events and materials, and e-learning is no exception. Driscoll (2013) explained that "it's likely that instructional designers approach problems from a particular point of view that is personal and unique to each of them, a kind of bias that affects their interpretation of the problem as well as candidate solutions they might consider" (p.362). Instructional designers, like the rest of humanity, act as a result of culturally shaped epistemologies and theories. When these beliefs go unnoticed and unacknowledged, as Subramony (2017) points out, problems can arise - especially when the epistemologies and theories of the designer differ from those of the learner. The increasingly international and intercultural nature of e-learning environments demands that instructional designers not only recognize the importance of culture but also include the cultural diversity of learners as a critical aspect of their designs.

Epistemological and Theoretical Foundations of Learning

Epistemologies are beliefs about knowledge and the nature of knowledge. When it comes to learning, one of the most basic questions is whether knowledge is absorbed "from the outside in" or "is constructed from the inside out" (Driscoll 2013, p.362). Those who answer the former are objectivists and those who answer the latter are constructivists. For the better part of the past century, objectivist and constructivist epistemologies have been the prevailing philosophies of learning within western higher education (Bates & Pool 2003). These paradigms have simultaneously informed and been informed by several learning theories, namely behaviorist, cognitivist, and constructivist approaches.

Objectivist Epistemology and Learning Theories

Objectivists assert that things which are things unto themselves are not affected by what we believe; that is, that they exist apart from the human mind. Within this paradigm, "knowledge is a kind of substance contained in and given form by the mind" (Bruffee 1999, p.152) and can be passed from one person to another. An objectivist approach to instruction places emphasis on the content to be learned. The role of the instructor is to possess knowledge, to organize it, and to pass it along to others. The goal of teaching is to "map a predetermined concept of reality onto the learner's mind" (Bellefeuille 2006, p.87). The role of learners is to grasp, duplicate, and build on the knowledge they receive. Two prominent learning theories that have their roots in objectivist epistemology are behaviorism and cognitivism.

Behaviorism is founded in Russian physiologist Ivan Pavlov's research on stimulus and response. It rose to prominence as a learning theory in the work of American psychologists Watson, Thorndike, and Skinner. These researchers emphasized the role of observable stimulus and response in the learning process. Both in keeping with scientific requirement for rigorous objectivity, and in reaction to Freud - whose ideas about the unconscious mind held sway during the early twentieth century - behaviorist considered what happens in the mind during learning as immaterial and insignificant (Harasim 2017). Behaviorist philosophies also took hold as a result of industrialization and World War II, which required a workforce who could follow instructions and replicate the same actions repeatedly. Instruction designed from a behavioral perspective foregrounds the instructor, who keeps content at the center of the learning process and creates carefully crafted objectives that underscore behavioral outcomes. Instructional activities focus on manipulating environmental conditions and emphasize the importance of reinforcement or reward.

Cognitive learning theory arose in the 1920s as the result of an increasing awareness that something more takes place "between stimulus and response" (Harasim 2017, p.49). For cognitivists, learning behaviors such as decision-making and response are not solely the result of observable stimuli; the mind also plays a role in the process. The creation of the first computer in 1946 inspired the idea of the mind as information processing software. Although cognitivism makes room for the immaterial by acknowledging the primacy of the mind, learning is still grounded in the objectivist ideal that behavior can be explained, shaped, and anticipated. Similar to behaviorism, the role of the instructor is to distil information into distinct and clear learning steps. Cognitivists believe that, given the right inputs and conditions, the human mind can be programmed to respond in specific and predictable ways.

Constructivist Epistemology and Learning Theory

A second epistemology that has dominated Western learning is constructivism. Constructivists believe that knowledge is not something that exists on its own but is created, negotiated, and fluid. They dismiss the idea that the goal of learning is for students to replicate existing knowledge or to respond in specific and predictable ways. Constructivists also reject the idea that knowledge can be judged as either correct or incorrect. In this paradigm, the learner is central, and their beliefs, experiences, and interactions shape the knowledge they create. The role of the instructor is to provide experiences and questions that guide a student in - but do not dictate - their meaning making process. The role of the learner is to make connections and meaning.

A prominent learning theory within constructivist epistemology is constructivism. Swiss psychologist Piaget and Russian psychologist Vygotsky are two researchers credited with the early development of its key ideas. Piaget championed the idea that children are not simply vessels waiting to be filled, but agents actively making meaning of their environment and events in accordance with age-related developmental stages (Piaget & Inhelder, 1969). Unlike Piaget, Vygotsky held that development followed learning, but agreed that learners actively construct

meaning from their environment, events, and especially social encounters (Vygotsky, 1978). The mind plays a significant role in constructivist learning but, unlike in cognitivism, its function is not to be programmed but rather to process and make sense of experience. The increasing interest in constructivism in the United States coincided with the Civil Rights and social reform movements of the 1960s and 70s.

AN ANALYSIS OF POPULAR INSTRUCTIONAL DESIGN MODELS

This article reviews seven popular instructional design models: Bloom's Taxonomy, ADDIE, the Dick and Carey Model, Merrill's Pebble-in-the-Pond model, the Kemp Model, Gagné's Nine Events of Instruction, and Universal Design for Learning. Some of the models are more theoretical in nature, while others are more practical. All have had a significant influence on the field of education and the development of e-learning products, as is evident by their continued use within the field of instructional design.

Any design of instruction requires the selection of a model to guide the process. When it comes to the design of e-learning that crosses cultures - where the creation of environments, strategies and materials that embrace diversity and cultural inclusiveness is critical - it is important to do so with great care. Beyond knowing the steps of a given model, it is also important to understand the context from which it emerged, the epistemologies and theories it is grounded in, and the level of cultural responsiveness embedded within the design itself. Knowing these aspects about a model will equip designers to make better choices about the models they employ.

ADDIE

One of the most widely utilized instructional design models is ADDIE, an acronym that stands for analyze, design, develop, implement, and evaluate. ADDIE is not a distinct model as much as it is a design process that numerous other models are built on or borrow from. ADDIE does not have a clear original author or source (Molenda 2015), however the use of ADDIE is first recognized in conjunction with the United States military in the 1940s in the form of Instructional Systems Design (Piskurich 2015). As a systems design approach, ADDIE fits comfortably with an objectivist paradigm.

The five phases of ADDIE move a designer through the process of creating an instructional product. Though originally conceived as linear steps, over time many have come to use it as a more iterative process and move back and forth among the phases. The *Analyze* phase directs a designer towards gaining a deep understanding of a given situation. It includes identifying the knowledge or skills gap, learners and their specific needs, and an appropriate instructional delivery system (Maribe Branch 2009). In the *Design* phase, information to be learned is organized into topics and tasks and performance objectives, which stipulate what a learner will be able to do as a result of the instruction. The *Develop* phase involves the actual production of the proposed content and media. *Implementation* concerns the delivery of the learning resource to its intended audience. *Evaluation,* the last phase, determines whether the product is effective in meeting its initial goals.

Although ADDIE lays out a complete design process, it is slim on details and specific guidelines. There is nothing within the general structure of ADDIE that explicitly addresses learner diversity and elements of cultural difference. As broad as the process is, however, it easily accommodates adaptations, which is likely why many other models have been built on or around it. These various adaptations may, at times, include an emphasis on learner diversity.

Bloom's Taxonomy

The idea to help educators isolate and classify the behaviors that should result from learning emerged from the 1948 convention of the American Psychological Association. The goal was to map out "the ways in which individuals are to act, think, or feel as the result of participating in some unit of instruction" (Bloom 1956, p.12). A handbook, with Bloom as editor, was published in 1956. The result is not a traditional "how-to" process, as Bloom and his colleagues were not concerned with aspects such as methods, materials, content, or interactions. Nevertheless, they intended it to be used by instructors and evaluators to inform curricula, instructional methods, and evaluation approaches.

In 2001, to draw attention to the relevancy of the original work and incorporate recent findings around learning and development, Anderson and Krathwohl published a revision of the taxonomy. Their updated version included changes to the emphasis, terminology, and structure of the original model. With these, they attempted to make the model more useful for teachers by underscoring how to use the taxonomy in the planning and alignment of curriculum, instruction, and assessment. The revised dimensions include the six objectives: *remember*, *understand, apply*, a*nalyze*, e*valuate*, and c*reate* (Anderson & Krathwohl 2001).

Both versions are grounded in behaviorist learning theory. They advocate the idea that knowledge and meaning are something external to the learner that, once acquired, are reflected in specific behaviors. In making the objectives - rather than the learner - central, Bloom and colleagues indicated their assumptions about the limited role learner diversity plays in effective learning design. The fact that the authors believed that their Taxonomy is applicable for all subjects and with all learners regardless of their context (Chyung & Stepich 2003) is further evidence of this. The revised taxonomy provides only slightly more consideration of learner diversity. By including metacognitive knowledge in their update, the authors stressed the importance of activating "relevant situational, conditional, or cultural knowledge for solving a problem in a certain context" (Anderson & Krathwohl 2001, p.44). They believed that, in addition to specific subject-matter skills and insight, students also need to develop knowledge about "the when and why" of using certain strategies (p.58), a distinction often shaped by sociocultural and situational norms.

Dick and Carey Model

Dick and Carey's *Systematic Design of Instruction* - also known as the Dick and Carey model - was first published in 1978 and is currently in its eighth edition. Its ten steps are built on the ADDIE pattern of analysis, design, development, implementation, and evaluation. Originally created for novice designers, the authors conceived of the model as a *procedural system* (Dick 1996; Dick, Carey & Carey 2009) where each step is informed by results from the previous step and, in turn, produces inputs for the next step.

The ten design steps outlined by Dick, Carey and Carey (2009) are as follows: 1) *Identify an instructional goal or goals* about what knowledge or skills learners will demonstrate as a result of the instruction. 2) *Conduct instructional analysis*, which is the detailed study of all the tasks or information - as well as prerequisite knowledge or skills - necessary to achieve the specified goal(s). 3) A*nalyze learners and context,* including their existing knowledge, attitudes, and behavior; how they will use their newly acquired knowledge; and the potential learning environment. 4) *Write performance objectives* based on the instructional analysis in step two. 5) *Develop assessment instruments* to help measure how successful learners are in achieving the objectives. 6) *Develop instructional strategy* to achieve the learning goal(s) and objectives. 7) *Develop and select instructional materials* informed by the selected instructional strategy. 8) *Design and conduct formative evaluation of instruction*, which involves collecting data to pinpoint any issues with the design and identify areas for improvement. 9) *Revise instruction* based on findings from step eight.

10) *Design and conduct summative evaluation* to see if the instruction has been successful in resolving the problem(s) it was designed to address.

The Dick and Carey model is rooted in behaviorist theory, where control of the content and learning lies squarely with the designer/instructor. Priority is placed on learning goals developed by subject-matter experts, administrative mandate, performance technology, or a specific content outline. The authors did not address learner diversity in a meaningful way in their model. Learners and their context are not considered until after goals have been determined and the designated knowledge and skills have been analyzed. Though, on a surprising note, the topic of globalization and the ease of the export/import of instruction that the Internet has brought about is briefly taken up. The authors questioned, for example, whether eLearning developed for learners in Utah will be equally effective for learners "in the Caribbean or China" (Dick, Carey & Carey 2009, p.8). However, they did not elaborate any further, and provided little detail in their model to address any corresponding concerns.

Merrill's Pebble-in-the-Pond Model

Unlike ADDIE-based models that begin with what Merrill (2002) considered to be abstract instructional objectives, Pebble-in-the-Pond begins the design process by identifying the content to be learned. This content, which is the pebble that initiates subsequent ripples of design, is presented as a real-world problem. The second step is to articulate a progression of related tasks/problems that increase in intricacy and allow learners to master the necessary skills or knowledge being taught. Step three is to identify the relevant knowledge or skills required and present these with instructions or demonstration. Step four is to select the appropriate instructional strategy and create functional prototypes of each task or problem. Step five is to refine and finalize the prototypes so that they are ready to be evaluated, produced, and implemented. The final step is to decide what data to collect to assess learning and evaluate the design, and then use that data to revise the prototype (Merrill 2002, 2013).

Merrill's model is influenced by both behaviorist and cognitivist theories. In terms of the former, content rather than learner need or preference determines instructional strategies. In terms of the latter, Merrill insisted that for instruction to be effective, it needs to tap into learners' existing mental models. However, although he recognized differences in learners' backgrounds and the capacities they bring to new learning situations, he did not consider the issue of cultural diversity relevant in the design process. Instead, Merrill maintained that that there are basic similarities in how all people learn and that these are slow to change (Merrill 2013). In other words, Merrill did not think that instructional strategies should vary significantly from person to person or from context to context.

Kemp Model

The Kemp Model - also known as the Morrison, Ross, and Kemp Model - has its origin in a design process developed in 1971 by Jerrold Kemp. The current model emerged from a 1994 adaptation and is now in its eighth edition (Morrison, Ross, Morrison, & Kalman 2019).

There are nine design components presented in a circular, rather than linear, model with the idea that a designer can begin at any point that seems appropriate for the context. The instructional designer needs to correctly identify the root *instructional problems* and whether these involve missing knowledge or skill. There should be an in-depth look at relevant *learner characteristics*, as well as the nature of the learning environment. The designer needs to conduct a *task analysis,* or content analysis, to establish what content needs to be included in instruction and determine sequencing and scaffolding. They also need to specify *instructional objectives* to clarify what a learner will be able to do as a result of their learning and to focus the instructional content, process, and assessment. Content should be arranged in an organized and efficient manner to help learners

achieve the specified instructional objectives through *content sequencing*. Designers should create an effective *instructional strategy* to account for learners' prior knowledge and promote deeper processing of the new materials. They also need to *design the message,* which considers how to present the information, including pre-instructional strategies, typography and text, and the use of images. There needs to be *development of instruction* to target the identified performance problem, including the selection of media and instructional activities. Finally, designers need to select *evaluation instruments* that correspond to instructional objectives (Morrison et al. 2013).

This model is unabashedly learner centered, maintaining that the role of the design is to focus on "how to improve individual performance rather than focus on what content to cover" (Morrison et al. 2013, p.12). However, the approach also emphasizes predetermined content objectives and therefore still fits within an objective rather than a constructivist paradigm.

In terms of learner diversity, the Kemp model creates more space than some of the other models under review. The authors stressed the need for analyzing learner characteristics, including unique capabilities, differences, ability levels, readiness, and stages of development. They also noted that learner, instructor, and designer behaviors and histories may differ because of cultural and/or ethnic diversity, and that careful consideration is required for these scenarios. These differences can affect learner readiness; communication and understanding (especially where there are language differences); and the degree to which learners engage in individual, original, or innovative work. The authors also included five guidelines for teaching culturally diverse learners.

Gagné's Nine Events of Instruction

An educational psychologist with a World War II military background, Gagné applied his disciplined nature and commitment to the rigors of scientific research towards better understanding learning and instruction. Learning, he determined, takes place when there is an effective combination of internal and external factors, which he referred to as *conditions of learning* (Gagné, Wager, Golas & Keller 2005). Internal aspects include learner motivation, previous knowledge, and existing capabilities. External aspects include planned learning activities, resources, and the environment. Instruction, an external event, needs to be carefully designed to support internal processes.

To this end, Gagné conceived of nine events of instruction that directly relate to internal processes of learning. 1) *Gain learner attention* to prime them to receive particular stimuli. 2) *Inform learner of objective(s)* to establish learner expectations and allow them to focus in on specifics. 3) *Stimulate recall of previously learned abilities* to encourage the recall of information or skills stored in the long-term memory and provide schemas for the new information to plug in to. 4) *Present the stimulus material*, that is share the new information clearly with critical aspects emphasized. 5) *Provide learning guidance* by offering students appropriate cues to help them connect new information to their existing knowledge and frameworks. 6) *Elicit performance* by asking learners to do something with the information they have learned. 7) *Provide feedback about performance* to help learners gauge the accuracy of their work and to reinforce learning. 8) *Assess the performance* to gauge whether learners have legitimately achieved the objective. *9) Enhance retention and* transfer through instructor-provided opportunities for review and additional feedback (Gagné et al. 2005).

Gagné is an example of a behaviorist-turned-cognitivist. His early research focused on conditioned operant response (Graham & Gagné 1940), but he gradually moved toward belief in the primacy of the mind and the theory of cognitive information processing (Reiser 2011). The *Nine Events of Instruction* are an example of a cognitivist design model. Although Gagné underscored the need for internal and external processes to work together for learning to take place, his primary emphasis is on factors within the learner. Among the nine events are also several that highlight the importance of working in tandem with the brain, such as promoting learner receptivity to stimuli, mobilizing their

executive control functions, connecting new information to existing neural networks, reinforcing encoding and recall, and enhancing retention and transfer.

This model contains some consideration of learner diversity. For example, Gagné emphasized that there is great diversity among learners in many areas including previous knowledge, experience, and motivation and how this, in turn, affects existing abilities (Gagné et al. 2005). He also asserted that early educational psychologist's inability to recognize the importance of a learner's social-cultural environment was highly problematic. Gagné felt that designers and instructors have an obligation to give consideration to learner differences, especially in terms of preexisting knowledge or skills and process schemas, and designed his model accordingly.

Universal Design for Learning (UDL)

Universal Design for Learning (UDL) is an approach to design that attempts to reduce or remove barriers to learning encountered by students with disabilities, and to benefit all learners in the process. The central tenets of UDL stem from architectural developments in the 1970s by Ronald Mace, who called for the consideration of a diversity of individuals when designing buildings and infrastructure (King-Sears 2009; McGuire, Scott & Shaw 2006). In 1984, the Center for Applied Special Technology (CAST) introduced the idea of universal design to learning ("CAST" n.d). Instead of placing the burden of responsibility on learners to conform to the needs of the curriculum, UDL maintains that the curriculum should conform to the needs of the learners.

There are three foundational principles to UDL. *Multiple means of engagement* are intended to target the affective networks of the brain that are responsible for learner inspiration and motivation. *Multiple means of representation* are intended to target the recognition networks that are responsible for "how we gather facts and categorize what we see, hear, and read" (Meyer, Rose & Gordon 2014, p.90). *Multiple means of action and expression* are intended to target the strategic networks that influence the ways ideas are grouped and responses are organized and communicated. While these networks are interdependent and support each other, it can be helpful to think about each independently when designing instruction. These same networks should also be considered in creating objectives, selecting resources, and determining assessment activities.

Universal Design for Learning is an example of a constructivist model with cognitivist influences. Instructors and more knowledgeable peers play a key role in helping learners aim for and reach abilities they are not yet able to do on their own. Learners, however, own the process and play a dynamic role by choosing among multiple means of engagement, representation, action and expression and actively developing their knowledge structures in the process. This knowledge, constructed through learner action and reflection, constitutes meaningful learning. Assessment can include the degree to which learning objectives are met, but since outcomes are not always observable or calculable it should also include reflection on the process and learner self-evaluation (Mergel 1998).

The authors of UDL paid considerable attention to diversity among learners, likening the uniqueness of every brain to the uniqueness of every fingerprint. By altering the focus of learning from consuming information and replicating skills to that of mastering the processes of their own learning, the goal of education shifts from homogenizing students to one that encourages students to create and personalize meaning and knowledge (Meyer, Rose & Gordon 2014). With this approach, curriculum and methods are defined and judged by how well they provide a diversity of learners ample means to engage with, represent, and demonstrate their knowledge.

USING POPULAR INSTRUCTIONAL DESIGN MODELS IN ICT4E

The seven popular instructional design models analyzed here contain some considerations of learner culture and diversity. For example, all the models acknowledge that learner backgrounds and internal processes differ, even if they disagree on what the effect of these differences are on learning. Most call for a learner analysis at some point in the design process, and advocate that learner needs and preferences be addressed within the instructional products developed. Similarly, most of the approaches prescribe evaluating instructional products and testing them with target learners to gauge their effectiveness and stress that user feedback should be incorporated before a final rollout. Some advocate that instructional activities should link the material being learned with learners' specific contexts so that they can better make meaning of it. A few of the models even speak to the important role of self-awareness on the part of designers, in terms of what preferences or prejudices they bring to the design process. Yet overall, these IDMs fall short in providing sufficient guidance for creating environments, strategies and materials that embrace diversity and cultural inclusiveness - aspects that are critical to the design of e-learning in emerging ICT4E contexts.

To accommodate for these shortcomings, some authors have proposed adaptations to IDMs. Dunn and Marinetti (2003), for example, outlined four strategies to modify online learning content, instructional strategies, and collaborative components for different cultural contexts. These strategies include translating, localizing, modularizing, and originating (where the latter two are likely to include restructuring or redevelopment or, at minimum, revised content and activities). A drawback of this approach, however, is that it involves modifying instructional products that have already been created, rather than considering culture from the outset of the design.

An approach by Thomas, Mitchell, and Joseph (2002) proposed to infuse cultural inclusiveness into the five phases of ADDIE. The authors introduced three parameters to guide each phase: intention, interaction, and introspection. *Intention* asks designers to acknowledge that no design is devoid of cultural bias, and to recognize the consequences of the design choices they make. *Interaction* encourages designers to interact with target learners at every phase of the process, and to view users – as much as possible – as the designers. *Introspection* invites designers to reflect on their own culturally informed educational traditions as well as their "own thoughts, beliefs, attitudes, desires, and feelings toward these cultures [for whom they are designing]" (Thomas, Mitchell, & Joseph 2002, p.44). Though promising in some respects, this approach is considerably limited by two factors. The first is that it is specific to the ADDIE model and does not address the broad range of other instructional design models in use. The second is that Thomas et al. asserted that compelling design can only be achieved by recognizing culture as having an "essential role in the socially mediated construction of reality" (Thomas, Mitchell, & Joseph 2002, p.40), which reflects a constructivist view. In other words, the authors essentially argue that cultural inclusiveness can only exist within constructivist approaches.

It is tempting to assume that there must be a specific IDM that is best suited for e-learning projects in emerging ICT4E contexts, or at least that some are better than others. However, this is not the case. Each model has its strengths and weaknesses and can be useful in supporting different outcomes. As Ertmer and Newby (1993) pointed out, different approaches can effectively serve different functions:

> ...a behavioral approach can effectively facilitate mastery of the content of a profession (knowing what); cognitive strategies are useful in teaching problem-solving tactics where defined facts and rules are applied in unfamiliar situations (knowing how); and constructivist strategies are especially suited to dealing with ill-defined problems through reflection-in-action. (p.60)

Therefore, instead of one specific model to use in designing e-learning content for diverse audiences, it is more helpful to have an approach that can be applied to a variety of instructional design models and those grounded in disparate epistemologies.

Recommendations for Making IDMs Culturally Inclusive

Modifying instructional products retrospectively or requiring a shift in epistemology cannot be the sole answers to creating inclusive design for e-learning. Fortunately, Frechette, Layne and Gunawardena (2014) provided a list of ten recommendations that offer a workable solution. Their first recommendation is for designers to begin their process by reflecting on how culture shapes their own preferences and biases around learning. This includes identifying what core beliefs (epistemologies) and theories guide their design decisions; articulating what they assume is "normal" or "best" in terms of methods; and examining their expectations of learners. For example, Powell (1997) pointed out that designers from, or primarily educated in, the United States are often shaped by a Puritan work ethic that is reflected in "concepts such as self-reliance, optimism about the future, positive attitudes toward change, faith in science, democracy, religion, pragmatism, and attitudes toward supervision and responsibility" (p. 11). Designers need to recognize and acknowledge these cultural preferences, yet also be able to work beyond them to include perspectives valued within other cultures.

A second and third recommendation by Frechette and colleagues is for designers to acknowledge the inherent difficulty in eliminating bias from their design, and not try to ignore or avoid cultural influence. By accepting that cultural neutrality is a myth, designers can stop striving to achieve it and instead make space for alternate and diverse experiences, perspectives, and preferences.

A fourth recommendation is to be wary of viewing culture as singular or static. Concepts of culture associated with geographical or physical place (such as country) and language are not only simplistic, but potentially dangerous if they are perceived as concrete and fixed categories that "claim certainty about what sort of people can be found where" (Holliday 2011, p. 5). The danger of this view, known as essentialism, is that it inadvertently seeks to shape and constrain people's behavior in definitive ways. It makes assumptions about identities, for example who is "foreign" or who "belongs". These opinions can inadvertently carry over into design decisions and messaging.

Three additional suggestions explicitly carve out a space for learners to help shape the course. These include allowing them a role in the design process, providing them choices within learning activities, and providing flexibility for them regarding course pace and timeline. Further, once implemented, learners should be encouraged to reflect on their own culturally primed preferences as well as challenge themselves to try less familiar paths. While these ideas lend themselves more naturally to IDMs based on constructivist principles, they can also be integrated into objectivist approaches.

Frechette, Layne and Gunawardena's (2014) final two recommendations are directed at the instructor. The first is, when possible, to allow disparate learner responses and results to stand without a need to resolve the tension between them. The second is to neither favor processes nor products, but to appreciate the role both have in promoting learning. This last point speaks to and challenges both objectivist and constructivist frameworks. Designers with an objectivist paradigm can continue their prioritization of learning products, while also recognizing the importance of process. Designers with a constructivist approach can maintain an emphasis on process, while also appreciating learning products.

Designers who value a constructivist approach will likely have an easier time overall incorporating these recommendations. The biggest challenge for them, perhaps, may be to acknowledge that their methods – flexible as they are – are still culturally informed. Constructivist designers may be

more inclined to see themselves as unbiased, or to see cultural neutrality in design as achievable. They, too, need to examine and be honest about their prejudices and culturally shaped beliefs and expectations. This also includes finding ways to accommodate and honor students who approach learning with an objectivist paradigm.

Designers creating e-learning around an objectivist framework should also examine and acknowledge the role cultural values and priming play in their approach, and in the selection and prioritization of specific subject matter. Rather than having to mute these biases, though, they should articulate and explain them. At the same time, designers should seek out and include other perspectives and approaches, to the extent they can, while still prioritizing the integrity of the content. In the same way culture helps to explain – but not define – them, designers should seek to understand the cultures of their learners without using these to limit or denigrate them. Offering choice and flexibility around the types of engagement and expression, and timelines, and demonstration of knowledge are also possible while still keeping the goal of instruction on the replication of content.

CONCLUSION

The growing appeal of e-learning around the globe means that digital education spaces are being inhabited by an increasingly diverse population of learners. The field of international development has also been taking note of digital solutions, especially considering the potential for e-learning to meet the needs of previously marginalized learners and contribute to the UN Sustainable Development Goal of quality education. Yet while considerable attention has been given to topics such as access to technology and appropriateness of content, little to no attention is being paid to the appropriateness of instructional design models. IDMs are necessary to the development of effective e-learning courses and materials. Yet they are not neutral tools. All models have sociocultural roots and reflect the values, beliefs, and practices of those who created them and the contexts in which they were created.

This analysis of seven popular instructional design models brings to light the underlying epistemologies and theories guiding them. It also highlights the fact that they contain little if any guidance on how to design for a diversity of learners, although a few at least acknowledge the need. While some processes for addressing cultural diversity in e-learning do exist, they mostly fall short. These include processes for retroactively addressing culture once the learning product has already been created, or processes requiring a significant philosophical shift.

However, a promising approach articulated by Frechette, Layne and Gunawardena (2014) provides a list of ten recommendations that are not tied to a specific epistemology and can be incorporated into a variety of design models. Their suggestions emphasize the need for designers to articulate their own biases and recognize how these influence the instructional design processes they undertake.

It is impossible to remove bias from instructional design models and impractical to try to create one model that meets all needs. Yet by using care in selecting a model that reflects an epistemology and learning theories appropriate to the setting, designing for diversity among learners, and following the provided recommendations, designers can take steps that will help them create culturally inclusive e-learning.

REFERENCES

Abdon, B., Raab, R. & Ninomiya, S. 2008. “eLearning for international agriculture development: Dealing with challenges”. *International Journal of Education and Development using ICT*, vol. 4, no. 1, pp. 80-94. Open Campus, The University of the West Indies, West Indies.

Anderson, L. W., & Krathwohl, D. R. 2001. *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives.* New York, NY: Longman, Inc.

Bates, A.W. & Pool, G., 2003. Change and stability in teaching with technology. *Effective Teaching with Technology in Higher Education: Foundations for Success*. San Fransisco, CA: Jossey-Bass.

Bellefeuille, G. 2006. “Rethinking reflective practice education in social work education: A blended constructivist and objectivist instructional design strategy for a web-based child welfare practice course”. *Journal of Social Work Education*, vol. 42, no. 1, pp. 85-103.

Berge, Z. & Leary, J. 2006. “Trends and Challenges of eLearning in National and International Agricultural Development”. *International Journal of Education and Development Using ICT*, vol. 2, no. 2, pp. 51-59. Open Campus, The University of the West Indies, West Indies.

Bloom, B.S., 1956. *Taxonomy of educational objectives. Vol. 1: Cognitive domain*. New York: McKay.Bloome, A. & Chassy, C. 2019. Information and Communication Technology for Education (ICT4E) How-To Note. United States Agency for International Development, Bureau for Economic Growth, Education, and the Environment, Office of Education. Available at: https://www.edu-links.org/sites/default/files/media/file/USAID%20ICT4E%20How-To%20Note%20Final.pdf

Boykin, A. W. 1994. “Afrocultural expression and its implications for schooling” in Hollins, E. R., King, J. E. & Hayman, W. C. (eds.) *Teaching diverse populations: Formulating a knowledge base*. Albany, NY: State University of New York Press. pp. 243–256.

Bruffee, K.A., 1999. *Collaborative learning: Higher education, interdependence, and the authority of knowledge*. Baltimore, MD: Johns Hopkins University Press.

CAST. n.d. *About CAST* [Online]. Available at: http://www.cast.org/about#.XTB8gOhKhPY (Accessed: 18 July 2019) Chang, W. W., 2017. “Approaches for developing intercultural competence: An extended learning model with implications from cultural neuroscience”. Human Resource Development Review, vol. 16, no. 2, pp. 158-175.

Chang, A. Y., Ghose, S., Littman-Quinn, R., Anolik, R. B., Kyer, A., Mazhani, L., Seymour, A. K., & Kovarik, C. L. 2012. “Use of mobile learning by resident physicians in Botswana”. *Telemedicine and e-Health*, vol. 18, no.1, pp. 11-13.

Cherie Blair Foundation. 2018. *Road to Growth: A model for boosting women’s business success* [Online]. Published jointly by the Cherie Blair Foundation for Women and ExxonMobil Foundation. Available at: http://www.cherieblairfoundation.org/wp-content/uploads/2018/11/cbfw-report-aug-2018-digital-version.pdf (Accessed 1 April, 2019)

Chyung, S. Y., & Stepich, D. 2003. “Applying the" congruence" principle of Bloom's taxonomy to designing online instruction”, *Quarterly Review of Distance Education,* vol. 4, no. 3, pp. 317-30.

Dick, W. 1996. “The Dick and Carey model: Will it survive the decade?” *Educational Technology Research and Development*, vol. 44, no. 3, pp. 55-63.

Dick, W., Carey, L., & Carey, J. O. 2009. *The systematic design of instruction* (7th ed.). Upper Saddle River, NJ: Pearson Education.

Diedhiou, A., Gilroy, K. E., Muntifering Cox, C., Duncan, L., Koumtingue, D., Pacqué-Margolis, S., Fort, A. & Bailey, R. 2015. “Successful mlearning pilot in senegal: delivering family planning refresher training using interactive voice response and SMS”. *Global Health: Science and Practice*, vol. 3, no. 2, pp. 305-321.

Driscoll, M. P. 2013. “Purely theoretical or theoretically pure?” in Morrison, G. R., Ross, S. J., Kalman, H. K. & Kemp, J. E. (eds.) *Designing effective instruction.* 7th ed. San Francisco, CA: John Wiley & Sons, Inc., p.362.

Dunn, P., & Marinetti, A. 2003. “Great cultural myths 2”. *E.Learning Age*, pp. 15-17.

Emerging360. 2018. *Empowering women entrepreneurs in Vietnam through mobile micro-learning* [Online]. Available at https://www.emerging-360.com/empowering-women-entrepreneurs-in-vietnam-through-mobile-micro-learning/ (Accessed: 1 April 2019)

Ertmer, P. A., & Newby, T. J. 1993. “Behaviorism, cognitivism, constructivism: Comparing critical features from an instructional design perspective”*. Performance Improvement Quarterly,* vol. 6, no. 4, pp. 50-72.

Frechette, C., Layne, L. C., & Gunawardena, C. N. 2014. “Accounting for culture in instructional design” in Jung, I. & Gunawardena, C. N. (eds.) *Culture and Online Learning: Global Perspectives and Research.* Sterling, VA: Stylus Publishing.

Gagné, R. M. 1985. *The conditions of learning and theory of instruction.* New York, NY: CBS College Publishing.

Gagné, R. M., Wager, W. W., Golas, K. C., Keller, J. M., & Russell, J. D. 2005. “Principles of instructional design”. *Performance Improvement*, vol. 2, pp. 44-46.

Graham, C. H., & Gagné, R. M. 1940. “The acquisition, extinction, and spontaneous recovery of a conditioned operant response”. Journal of Experimental Psychology, vol. 26, no. 3, pp. 251–280.

Hansson, H., Mozelius, P., Gaiani, S., & Meegammana, N. 2010. “Women empowerment in rural areas through the usage of telecentres-a Sri Lankan case study”. In 2010 International Conference on Advances in ICT for Emerging Regions (ICTer). IEEE. pp. 5-10.

Harasim, L., 2017. *Learning theory and online technologies*. New York, NY: Routledge

Holliday, A., 2011. *Intercultural communication and ideology*. London: Sage Publications Ltd.

Kemp, J. 1971. *Instructional design: A plan for unit and course development.* Belmont, CA: Fearon Publishers.

King-Sears, M. 2009. “Universal design for learning: Technology and pedagogy”. *Learning Disability Quarterly*, no. 32, vol. 4, pp/ 199-201. Retrieved from http://www.txite.org/pdf/docs/Programs/ME/UDLandLD.pdf

Maribe Branch, R., 2009. *Instructional design: The ADDIE approach*. Athens, GA: Springer Science & Business Media.

McGuire, J. M., Scott, S. S., & Shaw, S. F. 2006. “Universal design and its applications in educational environments”. *Remedial & Special Education*, vol. 27, no. 3, pp. 166–175. Retrieved from http://www.regent.edu/acad/schedu/pdfs/UD_Article_2006.pdf

Mergel, B. 1998. “*Instructional design and learning theory.”* Unpublished paper. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.645.7122&rep=rep1&type=pdf

Merril, M. D. 1983. “Component display theory” in Reigeluth, C. M. (ed.) *Instructional-design theories and models: An overview of their current status.* Hillsdale, NJ: Erlbaum, pp. 282-333.

Merrill, M. D. 1994. *Instructional design theory.* Englewood Cliffs, NJ: Educational Technology Publications.

Merrill, M. D. 2002. “A pebble-in-the-pond model for instructional design”. *Performance Improvement*, vol. 41, no. 7, pp. 41-46. Retrieved from http://learninginnovationlab.com/uploads/1/2/0/0/12000341/merrill-pebble_in_pond.pdf

Merrill, M. 2006. “First principles of instruction”. *Educational Technology Research and Development*, vol. 50, no. 3, pp. 43-49.

Merrill, M. D. 2013. *First principles of instruction.* San Francisco, CA: John Wiley & Sons, Inc.

Meyer, A., Rose, D. H., & Gordon, D. T. 2014. *Universal design for learning: Theory and practice.* Wakefield, MA: CAST Professional Publishing.

Molenda, M. 2015. “In search of the elusive ADDIE model”. *Performance Improvement*, vol. 2, pp. 40-42.

Morrison, G. R., Ross, S. J., Kalman, H. K., & Kemp, J. E. 2013. *Designing effective instruction.* 7th edn. San Francisco, CA: John Wiley & Sons, Inc.

Morrison, G. R., Ross, S. J., Morrison, J. R., Kalman, H. K. 2019. *Designing effective instruction*. 8th edn. Hoboken, NJ: John Wiley & Sons, Inc.

National Academies of Sciences, Engineering, and Medicine. 2018. *How people learn II: Learners, contexts, and cultures.* Washington, DC: The National Academies Press.

Piaget, J. and Inhelder, B., 1969. *The psychology of the child,* 2nd ed. New York, NY: Basic books.

Piskurich, G. M. 2015. *Rapid instructional design*. San Francisco, CA: John Wiley & Sons, Inc.

Powel, G. C. 1997. “On Being a Culturally Sensitive Instructional Designer and Educator”. *Educational Technology Publications*, vol. 37, no. 2, pp. 6-14.

Principles for Digital Development. n.d. [Online]. Available at https://digitalprinciples.org/

Rajab, K. D. 2018. “The effectiveness and potential of E-learning in war zones: An empirical comparison of face-to-face and online education in Saudi Arabia”. IEEE Access, vol. 6, pp. 6783-6794.

Rhema, A., & Miliszewska, I. 2012. “The potential of e-learning in assisting post-crisis countries in re-building their higher education systems: the case of Libya”. Issues in informing Science and Information Technology, vol. 9, pp. 149-160.

Reiser, R. A. 2011. “Gagné, Robert Mills” in Seel, N. (ed.) *Encyclopedia of the Sciences of Learning*. New York, NY: Springer Science & Business Media, pp. 1335-1337.

Setboonsarng, S., & Zhang, J. 2006. “Using ICT in capacity building for poverty reduction in Asia: Lessons learned from the microfinance training of trainers course” [Online]. Asian Development Bank. Available at https://www.think-asia.org/handle/11540/3638 (Accessed: 1 April 2019)

Simpson, G. G., Gerard, R. W., Goodenough, W. H., & Inkeles, A. 1961. “Comments on cultural evolution”. *Daedalus*, vol. 90, no. 3, pp. 514-533.

Subramony, D. P. 2017. “Instructional technologists' inattention to issues of cultural diversity among learners” in Benson, A. D., Joseph, R., & Moore J. L. (eds.) *Culture, learning, and technology: Research and practice*. New York, NY: Taylor & Francis.

Thomas, M., Mitchell, M. and Joseph, R., 2002. “A cultural embrace”. TechTrends, vol. 46, no. 2, pp.40-45.UN SDGs. (n.d.). *Sustainable development goals* [Online]. Available at https://www.un.org/sustainabledevelopment/education/ (Accessed: 11 October, 2018)

World Vision Lebanon. 2016. *New e-learning education programme helps Syrian refugee children flourish* [Online]. Available at https://www.wvi.org/article/new-e-learning-education-programme-helps-syrian-refugee-children-flourish (Accessed: 1 April 2019)