Contextual Teaching and Learning for Practitioners

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ABSTRACT

Contextual Teaching and Learning (CTL) is defined as a way to introduce content using a variety of active-learning techniques designed to help students connect what they already know to what they are expected to learn, and to construct new knowledge from the analysis and synthesis of this learning process. A theoretical basis for CTL is outlined, with a focus on Connection, Constructivist, and Active Learning theories. A summary of brain activity during the learning process illustrates the physiological changes and connections that occur during educational activities. Three types of learning scenarios (project-based, goal-based, and inquiry-oriented) are presented to illustrate how CTL can be applied by practitioners.

Keywords

contextual, connections, constructivist, active learning, brain research, scenarios

WHAT IS CONTEXTUAL TEACHING AND LEARNING?

Imagine signing up for a computer-programming course and arriving the first day of class to a room with only desks, chairs, and a chalkboard. During the 1970s, when curiosity about the relatively new phenomenon of microcomputer programming led many students to enroll in computer classes, students accepted being taught about computers in a traditional classroom with a textbook, lectures, and diagrams on a chalkboard. Who could have imagined then, that, one day, a computer with instant world-wide wireless access would fit into a shirt pocket and that courses about computers could be taught through and even *by* that miniscule piece of hardware? The ability to teach content in context—for example, letting students learn to program a computer by actually programming a computer rather than by just reading or listening to someone talk about it—has been drastically enhanced by computer technology. Much has been written about teaching with technology, which is only half of the preceding story. The other half of this story is the idea of teaching content in context.

Defining CTL

Nationally, administrators, teachers and adult learners find themselves drawn to a concept referred to as Contextual Teaching and Learning (CTL) as they seek ways to improve teaching and learning in public schools and universities. A preliminary definition of CTL emerged from projects sponsored by the Office of Vocational and Adult Education, U.S. Department of Education. Ohio State University in partnership with Bowling Green State University utilized this funding to study CTL, and they consequently developed the following working definition: *Contextual teaching and learning is a conception of teaching and learning that helps teachers relate subject matter content to real world situations; and motivates students to make connections between knowledge and its applications to their lives as family members, citizens, and workers; and engage in the hard work that learning requires[1]*.

Theoretical Basis of CTL

Wise practitioners are wary of teaching and learning techniques that appear and then just as quickly disappear. Because CTL incorporates several existing educational theories, it can be said that it is based on sound pedagogy.

CTL and Connection Theory. According to Berns and Erickson, "contextual teaching and learning helps students connect the content they are learning to the life contexts in which that content could be used"[1]. Teaching students to program computers by letting them practice on real computers is a step in the right direction, but there is more to contextual teaching than just letting students practice on the same equipment they might encounter in the real world. First, they must be made aware of how the work they are doing relies on skills they already have (reading, writing, logic, etc.). Vygotsky refers to this gap between what is known and what is being learned as the *Zone of Proximal Development*, and

he stresses the importance of social interaction between the student and someone (perhaps even another student) who is more skilled at the tasks being learned [2]. As they strive to attain learning goals, students draw upon their previous experiences and build upon existing knowledge. They find meaning in the entire learning process, not just in their computer programming class. "By learning subjects in an integrated, multidisciplinary manner and in appropriate contexts, they are able to use the acquired knowledge and skills in applicable contexts" [1]. The ideal connection process would be three-fold: (1) students review what they already know related to the new concept; (2) they learn about and practice the new concept; and (3) they tie what they have learned to a real-life scenario.

CTL and Constructivist Theory. Incorporating the principals of contextual teaching helps to promote authentic learning and increases students' success by allowing them to make connections as they construct knowledge. In his writings, well-known Swiss biologist, philosopher, and child psychologist, Jean Piaget views the origin of knowledge as genetic epistemology, which he also calls constructivism, due to his belief that "knowledge acquisition is a process of continuous self-construction" [3].

Mayer contends that the concept of constructing knowledge is different from two earlier popular views of learning: (1) learning as response strengthening, based on the study of animal learning in laboratory settings, and (2) learning as knowledge acquisition, where the learner passively absorbs information presented by the expert. He states: *Constructivist learning is active learning in which the learner possesses and uses a variety of cognitive processes during the learning process. The major cognitive processes include paying attention to relevant information, organizing that information into coherent representations, and integrating thee representations with existing knowledge* [4].

CTL and Active Learning Theory. Many educators think of active learning as any strategy that deviates from the traditional lecture format where a teacher imparts knowledge by talking about it. Chickering and Gamson suggest that to be active, students must be doing more than listening [5]. Such strategies as cooperative and collaborative learning, integrated learning, problem-based learning, and work-based learning may be used to encourage inquiry and stimulate higher-order thinking. Research has shown that when students are allowed to manipulate their learning through the use of such strategies, they become problem solvers and they incorporate problem-solving skills throughout their formal education experience [6]. Lankard calls it "learning by doing", and divides active learning into these three categories: *(1)* ***action learning****, based on the premise that learning requires action and action requires learning; (2)* ***situation learning****, where knowledge and skills are taught in contexts that reflect how the knowledge will be used in real-life situations; and (3)* ***incidental learning****, which is defined as a spontaneous action or transaction, the intention of which is task accomplishment, but which serendipitously increases particular knowledge skills, or understanding i.e. learning from mistakes, learning by doing, learning through networking, learning from a series of interpersonal experiments* [7]. In a study of active, interactive, and reflective learning, Berge quotes Lave to stress the importance of constructing meaning through contextual learning among students: *The ideal situation is for independent learners to take what they have learned and apply it, making it meaningful in the context of actions and interactions within their own lives as they seek personal satisfaction, credentials, and advancement on their life path. When students have the opportunity to interact with one another and their instructors, they can analyze, synthesize, and evaluate course content and use their new learning to construct a shared meaning, making sense of what they are learning in the context of their own community of practice* [8].

As the three theories are examined, some recurring themes emerge. The computer-programming example mentioned earlier provides us with a scenario for contextualizing the three theories. After the students have practiced writing programs in the classroom, they might be given portions of code from an actual company and then asked to determine what the output might be. They could be put into groups and asked to think about a scenario, such as a particular customer-service operation in a business, and write a program to solve a problem in that department. They could first be asked to write out the logical progression of steps, and then convert them to the programming language, which they would then type in and troubleshoot.

CTL and Brain Research

Historical philosophers and educators including William James, John Dewey, Jerome Bruner; as well as contemporary author Robert Sternberg, support the idea of making connections in education. In addition, in the past couple of decades, neuroscientists have shown that this need for connections in the teaching and learning process may very well be rooted in the basic physiological function of the brain itself [9].

To understand how we learn, one must understand how the brain transforms learning experiences into actual physiological connections in the brain. The following summarizes the basics from **Brain Facts**, a downloadable file from the Society for Neuroscience:

> *The human brain is made up of three main parts: (1) the brain stem and cerebellum, (2) the limbic*

system, and (3) the cerebrum. The cerebrum is where learning actually takes place.

*The **cerebrum,** the most remarkable part of the brain **controls our language development, our thoughts, and our voluntary actions, and stores our long term memories**. This is the part that makes us human.*

*It contains about **three-quarters of the 100 billion neurons in our brain.** This is the part that holds the **key to the brains efficient system of communication and of making connections.***

Neurons communicate** with each other by **releasing several kinds of chemicals, called neurotransmitters**. An individual neuron receives messages from other neurons and based on the **strength of the electrical signals that excites the neurotransmitters decides to pass the message along.

*The **neurotransmitter pass** to other neurons over **tiny gaps** called **synapses**. The **synapse contact points**-which **number in the thousands** –are **tree like fibers called dendrites,** which are branching arms of the neurons that transmit and receive messages.*

*What is interesting about this complexity is **that new synapses tend to accumulate** as the brain **acquires new information and new experiences**. Thus, our brains create neural networks and maps as we gain experiences. When no connection to an experience can be found, or when the neurotransmitter impulse is very weak, a message is not sent to other neurons.*

From experiments made with animals, new experiences that activate certain parts of the cerebrum seem also to make the neurons grow fuller and richer. Their cell bodies become larger and their dendrites develop new branches on which to accept additional connections with other cells [10].

Jensen reiterates that the connections in the human brain are what provide us with the ability to learn. He states, "The key to getting smarter is growing more synaptic connections between brain cells and not losing existing connections" and "good quality education encourages the exploration of alternative thinking, multiple answers, and creative insights" to encourage those synaptic connections to continue to grow [11]. Thus, according to the experts, there seems to be a direct relationship between enriched environments, life experiences, and brain development [12]. The key to coordinating this relationship is the careful selection of teaching methods designed to provide a contextual learning environment.

CTL IN PRACTICE

While the relevancy of contextual teaching and learning has been thoroughly researched, the country's population has become more diverse and educators are faced with the challenge of designing a curriculum that meets the needs of all different types of people. According to Blanchard, CTL strategies that may help to meet each learner's distinct needs include: *(1) emphasize problem-solving; (2) recognize the need for teaching and learning to occur in a variety of contexts such as home, community, and work sites; (3) teach students to monitor and direct their own learning so they become self-regulated learners; (4) anchor teaching in students' diverse life-contexts; (5) encourage students to learn from each other and together; and (6) employ authentic assessment* [13].

Today, education systems risk imposing educational strategies that do not meet the individual needs of the students. The inherent danger of advocating a particular approach to instruction is the possible misconception that readers might assume that this approach is now "the" approach to use. Tennyson refers to the "situation of advocating a relatively simple solution to a complex problem" as the "big wrench approach to problem solving". The three approaches that will be discussed here are not being recommended as the "big wrench"; rather, they will be introduced and suggested for the value they may offer to practitioners who are in the process of evaluating techniques that might work for them and their students.

Helping students construct their own knowledge can be accomplished by guiding them through scenarios where they are required to actively explore the content in order to reach a goal, solve a problem, complete a project, or answer a question. This is a shift away from the traditional, or classical, classroom where the professor imparts knowledge and students receive it; and more toward the direction of student-centered, and even self-directed learning. The following scenario examples (goal-based, project-based, and inquiry-oriented) offer ideas for incorporating CTL in the classroom:

Goal-Based Scenarios

Schank, Berman, & Macpherson's Goal-Based Scenario (GBS) design is based on the foundation that "the best way to teach is to place students in situations in which the goals they wish to achieve require the acquisition of the knowledge and skills you wish to impart" [14]. Components of a GBS include:

*(1) **The learning goals**. These fall into two categories: Process knowledge and content knowledge, focusing on the skill set students*

need to practice and content knowledge they need to find;

(2) ***The mission****. A realistic goal that the student will relate to, and that will require the skills and knowledge stated in the learning goals, is chosen;*

(3) ***The cover story****. A scenario or background story that allows opportunities for the student to practice the skills and seek the knowledge stated in the learning goals is created;*

(4) ***The role.*** *A role that is truly motivating to the student and that helps the student practice the necessary skills is selected;*

(5) ***The scenario operations****. Is comprised of all activities the student does in order to work toward the mission and the learning goals. Examples include: asking experts for opinions relevant to completing the report, compiling information for future reference, making claims about strategies, and backing up claims from the information compiled; and*

(6) ***Resources.*** *Feedback can be given in any of three ways: through consequence of actions, coaching, or domain experts telling stories that pertain to similar experiences* [14].

Project-Based Scenarios

Lenschow points out, "Project-based learning (PBL) is winning ground in industry and at a slower rate in universities and colleges" and is "pedagogically based on constructivist learning in a setting represented by Kolb's learning cycle" [15]. Van Kotze and Cooper believe that PBL "seems to open up possibilities for our students to draw on their prior expertise and knowledge (nurtured in collective struggle), and to build on their experience gathered at their different sites of practice and learning" and that it allows them to "construct new knowledge that is action-oriented and socially relevant, while at the same time gaining academic recognition and accreditation" [16]. Van Kotze and Cooper share their version of PBL:

(1) Students select a topic and form groups;

(2) They plan their project and present plans to each other;

(3) They have weekly meetings where they report on work done, discuss their learning, and plan the next week;

(4) The prepare and conduct an "agogic moment" where the outcome of the project is presented to the commissioning organization;

(5) They prepare a comprehensive report on the project (both content and process) and participate in a collective evaluation process, involving all students in the group and relevant academic staff. [16].

Inquiry-Oriented Scenarios

Bevevino, Dengel, and Adam's inquiry-oriented approach is based on Piaget's cognitive development principles. It puts students into situations "that demand critical thinking and encourage the internalizing of major concepts" and also gives them "the opportunity to express, confront, and analyze preconceptions and misconceptions in an active, non-threatening way" [17]. Bevevino et al. describe their approach:

(1) ***Phase 1 Exploration****. Requires students to use prior knowledge and experience to solve a problem or series of problems presented in a simulation or game that examines the concepts to be developed throughout the learning cycle;*

(2) ***Phase 2 Discussion and Presentation of New Content.*** *In this phase, the students share their proposed solutions, describe conflicts they experienced and strategies they used to gain consensus, and the teacher introduces new content relative to the issue. During the discussion, the whole class scrutinizes each solution according to logic and mutual benefits tests;*

(3) ***Application and Expansion.*** *Requires the students to apply the knowledge, skills, and insights acquired in Phases 1 and 2 to a new situation or to creatively extend their knowledge into new areas of exploration. Each group develops its alternative solutions to a new problem, and the learning cycle ends with the whole class coming to a consensus as to the best solutions offered.*[17].

Scenario learning offers students opportunities to actively engage in constructing their own knowledge. They may have varying degrees of input into developing the scenarios, or selecting content; but as they work through the problem-solving steps, they are learning the content and also developing ownership of their own learning process. Creating scenario learning experiences can be time consuming, and this technique may be viewed by some as adding more work to already over-worked teachers; however, more and more resources are

becoming available, particularly on the Internet, with libraries of prepared scenarios to choose from.

SUMMARY

Contextual Teaching and Learning (CTL) has been defined here as a way to introduce content using a variety of active-learning techniques designed to help students connect what they already know to what they are expected to learn, and to construct new knowledge from the analysis and synthesis of this learning process. A theoretical basis for CTL has been outlined, with a focus on Connection, Constructivist, and Active Learning theories. A summary of brain activity during the learning process illustrates the physiological changes and connections that occur during educational activities. Three types of learning scenarios (project-based, goal-based, and inquiry-oriented) are presented to illustrate how CTL can be applied by practitioners.

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