Chapter 21
Critical Thinking, Instruction, and Professional Development for Schools in the Digital Age

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ABSTRACT

This chapter presents theories, issues and practices for creating effective, technologically rich learning environments in schools. In the digital age, teachers and school leaders must work together to ensure the development of higher level critical thinking skills for students. Using Bloom's Revised Taxonomy of Knowledge and Webb's Depth of Knowledge as theoretical guides, this chapter discusses how teachers may move towards more flexible, student-centered instructional models rather than traditional teacher-centered methodologies. Guiding questions are presented to assist teachers in determining what to consider when designing technology-enhanced instruction to promote higher level critical thinking skills. Topics include a review of technological factors influencing technology integration, modifications of teacher practices to best match the changing culture in K-12 classrooms, examinations of pedagogical practices in techno-centric classrooms, current and future professional development needs for teachers, and the importance of assessment and evaluation in monitoring the effectiveness of instructional practices in 21st Century learning environments.

INTRODUCTION

This chapter presents a framework for creating effective technologically-rich learning environments for students and teachers in schools. Bloom's Revised Taxonomy (Anderson & Krathwohl, 2001) and Webb's (1997) Depth of Knowledge are used as guides for developing high quality instructional

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activities with technology. This approach suggests how teachers and trainers may move towards more flexible, student-centered instructional models which are focused on critical thinking and technology use rather than a traditional teacher-centered methodologies. Guiding questions are presented to assist teachers in determining what to consider when designing technology enhanced instruction to promote higher level critical thinking skills. Topics include a review of technological factors influencing technology use in schools, a discussion on how to select appropriate technologies for student use and critical thinking and the impact of assessment and evaluation on determining the effectiveness of instructional practices in 21st Century learning environments, and professional development to support teachers in providing effective digitally integrated instruction.

THEORETICAL FRAMEWORK

Bloom's Taxonomy provides a suitable theoretical framework for identifying sequential educational objectives to guide instructional practices that move students from lower knowledge levels to higher level thinking skills (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956). Bloom's original Taxonomy identified the following six levels of learning: a) knowledge, defined as recalling previously learned information; b) comprehension, defined as understanding the meaning of information; c) application, defined the use previously learned information in new situations to solve problems that have single or best answers; d) analysis, defined as the ability to break down information into component parts and examining those parts to support the development of generalizations; e) synthesis, defined as developing the ability to creatively conceive new or original concepts; and f) evaluation, defined as having the ability to judge the value of information based personal values and opinions. Anderson and Krathwohl (2001) revised and redefined Bloom's original Taxonomy to reflect how it intersects with and acts upon factual, conceptual, procedural and metacognitive knowledge levels. The Revised taxonomy changed the categories from nouns to verbs to acknowledge active learning processes from lower order thinking levels to higher order thinking levels. The six revised Taxonomy levels are: a) remembering, defined as recognizing or recalling knowledge from memory; b) understanding, defined as constructing meaning from different type of functions; c) applying, defined as carrying out or using a procedure through executing or implementing; d) analyzing, defined as breaking material into concepts or parts and determining how the parts are related to one another; e) evaluating, defined as making judgments based on criteria and standards through checking and critiquing; and f) creating, defined as using critical thinking to combine elements to form a coherent or functional whole.

Bloom's Revised Taxonomy levels increase in complexity from the lowest three levels of knowledge, comprehension and application, to the higher levels of analysis, evaluation and creating. The lower levels typically focus on convergent thinking and the higher levels on divergent thinking. Convergent thinking occurs when teachers use traditional methods to transmit information such as factual knowledge they know to the students and the students begin receiving, collecting and remembering the information (Bar-Yam, Rhoades, Sweeney, Kaput, & Bar-Yam, 2002; Tomar & Sharma, 2005). Student learning following convergent instruction is typically assessed using formal testing and there is usually only one right answer to the question or problem.

Divergent instruction is a term used to describe a focus on the higher critical thinking levels of Bloom's Revised Taxonomy. Divergent instruction allows the student to use many resources (such as information technologies) to find answers or solutions to a problem. Divergent instruction promotes divergent thinking that allows students to become actively involved in their own learning.

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