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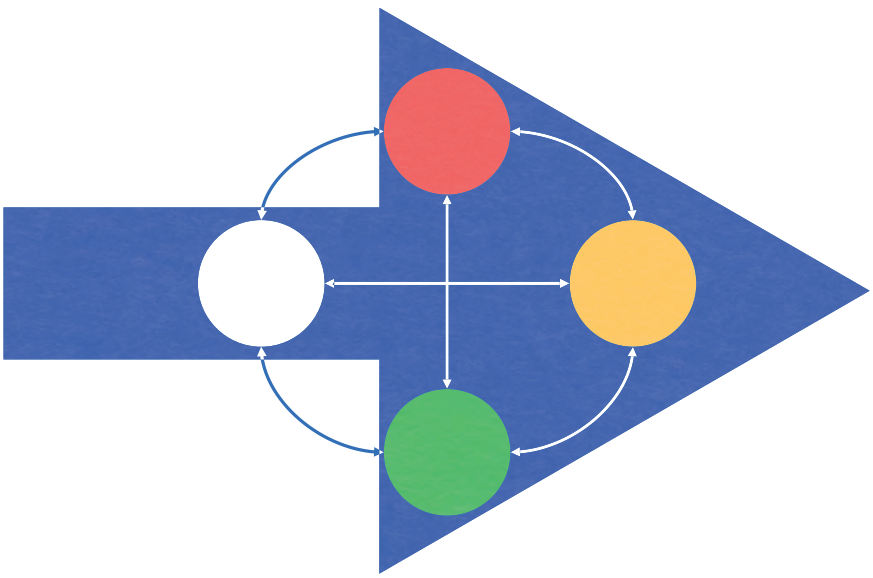
Digital Media in Teaching and its Added Value



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Preface

The University of Nebraska at Omaha (UNO) and the University of Agder (UiA) (formerly known as Agder University College) have enjoyed an enduring and rich history of research collaboration, student immersion experiences, joint curriculum development, international class projects, and joint workshops. Since 2001, nearly 200 students and 40 faculty have participated in exchanges and research visits, funded in part by a $300,000 (1,750,000 NOK) grant from the Senter for Internasjonalisering av Utdanning (SIU, Center for International Cooperation in Education). Beginning with collaboration between the information systems departments at the two institutions, collaboration has expanded to involve many colleges on both campuses in the fields of technology, engineering, health and sports, public affairs, political science, education, economics, and social sciences.

The backbone of the collaboration between UNO and UiA has been a series of workshops held, alternately, in Kristiansand, Norway and Omaha, Nebraska. At these working-workshops, 30–50 faculty from the two institutions have met to share ideas and research, brainstorm future opportunities, and bring new faculty into the collaboration. The idea for the current volume emerged from discussions held at the workshop in Omaha in October, 2013. By the end of the Omaha workshop, project leaders, who acted as editors, identified a process for turning the discussions into this volume.

Participants in the workshop discussions were invited to submit brief abstracts of their projects. A call for abstracts also was sent to faculty colleagues at both UiA and UNO who were not able to participate in the workshop, but were actively engaged in using digital media and tools in innovative ways to deliver online and hybrid courses. Simultaneously with the request for abstracts, the editors established the guidelines for submission, review, and feedback to authors, as well as outlined the plan for moving from abstracts to final chapters. The project progressed in stages: 1) brief abstract, 2) extended abstract; 3) digitally mediated workshop presentations by authors, 4) chapter length drafts, 5) final chapters, and 6) publication. At each stage, the editors evaluated and reflected on the procedures and the process. In addition, they sought feedback from the contributors through an online questionnaire.

Given the theme and international nature of the volume, the editors were very conscious of using digital media to communicate with the authors to build a sense of team among the contributors and the editors. While email was a primary tool for distributing basic information, collaborative/interactive sessions utilizing Cisco System's Collaboration Room capabilities, WebEx, and personal contacts were used to keep the authors moving forward. The editors used the same strategies and tools to communicate with each other.

In the first stage, each of the brief abstracts was independently reviewed by at least two of the editors. The editors used a protocol to evaluate whether the project fit with the overall theme and to decide whether to request an extended abstract for consideration. After review, authors were asked to submit extended abstracts (stage 2),

describing their projects in more detail. These extended abstracts were used to develop a "blended workshop" (stage 3) jointly hosted online by the two institutions in October, 2014 at which the contributors presented their projects to each other. Contributors attended the workshop through three Cisco rooms in three cities or by connecting directly to the meeting from their own workstations. During the workshop, back channel communication using *todaysmeet.com* supplemented spoken communication and provided an important source of feedback to presenters. The workshop provided an opportunity to ask questions, to pursue new lines of thinking, to compare similarities across the projects, and to learn new strategies for delivering courses and evaluating students. Video recordings of the presentations enabled participants to review the presentations and discussions in detail. Editors then provided detailed feedback to authors who were asked to develop chapter length reports of their projects (stage 4).

Chapter length drafts were reviewed carefully by the editors to determine whether the chapters would be accepted for inclusion in the volume and to provide detailed feedback with specific instructions for revisions. The authors were offered an opportunity to meet with the editors who reviewed their chapters via video conference if so desired. Publisher's standards for the final chapters were distributed to the authors. The final chapters underwent final reviews to ensure that requested revision were made and to ensure conformance with the publisher's requirements. It should be noted that four of the editors also authored chapters. Their submissions underwent the same review process at each stage as all the other authors'.

The editors entered the project with certain goals in mind, a set of steps to move to the finished product, and a commitment to maximizing digital media and tools to complete the project. As all the contributors, and the editors know from experience, some flexibility and critical self-analysis (reflection) is needed to refine the instructional approaches and strategies to engaging in online instruction/learning. The editors spent considerable time at each stage reviewing what they did, how they communicated with each other and the authors, what tools worked and how well they worked. The initial, in-person workshop launched the project. The mid-project blended workshop propelled the project to completion. That workshop and the various communication tools allowed the authors to become not just a collection of writers contributing to this volume, but to become a group of colleagues with shared concerns, a commitment to digital learning, a thirst for documenting best-practices, and a hunger to improve instruction and provide optimum learning experiences for students. The editors conducted surveys and collected feedback from the participants which will be analyzed to determine the viability of the process used to create this volume.

It has been an honor and a privilege to work with our colleagues. The journey does not end with the publication of this volume. A number of questions remain to be explored. Among these are: What instructional approaches and strategies are most effective in online learning? What assessment strategies are best suited to measuring student performance and informing instructional practices?

Furthermore, new questions and ideas emerged from the ongoing discussions and creation of this volume. An important topic/theme, that was not the primary focus of this volume, but is certainly extremely important, is to examine the alignment of

learning styles/learner needs with instructional style/learner outcome expectations. This may be the next joint effort. The editorial team looks forward to the continuing journey and thanks all of those who joined us for this portion of the trip.

David F. Conway
Omaha and Kristiansand, 15th of November 2015

David F. Conway, Melodee Landis, Stefanie A. Hillen, Mary T. Schlegelmilch and Peter Wolcott

The Value of Investigating Information Technology Applications for Teaching and Learning Purposes

1. Overview on the Value of Investigating Information Technology Applications for Teaching and Learning Purposes

This compilation of papers will show the value of investigating information technology applications for teaching and learning purposes. These contributions aim to shed light on alternative learning opportunities, to analyze, enhance and adjust learning processes, and to identify ways to empower learners that would not have been available without the technology. Applications of information technology (IT) have the potential to provide new modes of learning and to enhance learning activities within classrooms as well as to expand access to the curriculum through distance learning and blended approaches. This volume seeks to describe the ways educators have applied technology to increase access markedly and add recognizable value to the teaching and learning process.

1.1 IT-Pedagogy in Education

Applying digital media is in vogue and without any doubt a part of everyday life. It is therefore an essential part of teaching and learning, too. Most researchers no longer discuss whether digital media is to be applied or not. Rather, most focus on questions of how to apply and integrate IT purposefully for specific intended effects and learning outcomes. Theories, approaches, and models are based on the research results from several related disciplines, e.g., education, psychology, sociology, information technology, and knowledge management. They frame, shape and offer media approaches within each interdisciplinary context.

The unique focus of this volume lies in the intersection between pedagogy and technology, specifically the innovative use of technology to improve higher education teaching and learning. With the increased mobility of faculty and students, greater diversity among students and faculty, increased cross-disciplinary design, alternative environments enabled by technology and greater demand from the millennial generation for increased access and flexibility, it is important to share accounts where technology has made a positive impact on the instructional process. The contributions here demonstrate that technology can be applied in a variety of creative ways; that is, there are several approaches instructors have deemed as best practice. Because of the unique partnership among the faculty of the University of Agder in Kristiansand, Norway, and the University of Nebraska at Omaha in Omaha, Nebraska, USA, the contri-

butions in this volume center on the applications of digital technologies that add value to the teaching and learning process in a globalized context.

1.2 Theoretical Frameworks

Over the past decades, educational theorists and practitioners have studied and analyzed how best to use technology in instruction. Their conclusions range from those of skeptics decrying the waste of funds with little appreciable sign of change (Cuban, 2013; Cuban, 2001) to those who see the use of instructional technology as superior to traditional methods of instruction (Prensky, 2012). Some scholars have stepped forward recommending their own strategies for using new technologies in instruction; others have devoted themselves to a more empirical study of outcomes.

One of the most distinguished researchers of education and media, Richard E. Mayer (Clark & Mayer, 2011; Mayer & Moreno, 1998), has been researching the combinations of information modes and codes (*cognitive psychology*). Many of the developed principles are still reliable for media application and teaching. This is true in the work of Sweller (1999) as well. He supports the notion that cognitive load plays a vital role in limiting what kind and amount of information can be accessed at once (*educational psychology*).

Salomon et al. (1991) and Jonassen et al. (2007) are known for their theories of the integration of 'man and machine'. Their ideas to let learners work with technology as cognitive tools has resulted in the concept of media as 'mind tools' or 'cognitive tools' to extend the reach of the human mind (*cognitive psychology and constructivist learning*). Jonassen (2011) has worked on a variety of constructivist learning approaches using technology, emphasizing the importance of students using the tools to construct their own knowledge.

Another theoretical approach, which stems from teaching traditions and models in the United States (Dick, Carey, & Carey, 2004) and Europe (Jank & Meyer, 2010) emphasizes the *pedagogy* and/or *the instructional design* to construct learning activities that make use of information technologies.

New emphases and approaches such as *individualization, personalization, self-directed and collaborative learning* (Goodyear, Jones, & Thompson, 2014)*, gaming* (Prensky, 2001)*, seamless learning* (Milrad et al. 2013), *learning analytics* (Gašević, Dawson, & Siemens, 2015), and the trend of *increasing online classes* in higher education (Bates & Sangrà, 2011), *MOOCs,* etc., are challenging existing instructional strategies.

The relationship between information technology and teaching and learning is multifaceted. In many cases information technology may simply be a tool that facilitates previously existing pedagogical activities. For example, presentation and communication technologies may substitute for or extend manual or face-to-face practices. Information technology may also enable new forms of educational experience by enabling collaboration, feedback, and personalized instruction that are difficult or impossible in traditional educational settings. In many cases, information technology is the object of learning, as students learn to construct, use, and apply technol-

ogy. Established pedagogical practices may be applied to the teaching and learning of IT skills. In other cases, methodologies or techniques developed or refined within the information technology domain may take root in other domains, such as education.

IT pedagogy questions and elaborates on the way of teaching with media and on the application and integration of information technology for the empowerment of the learner in its interdisciplinary context.

Within the discipline of Information Technology and Information Systems (ITS) itself, opinions and strategies were proposed and established on appropriate ways of teaching ITS called 'pedagogy of informatics' or 'ITS-pedagogy'. Well established and newer teaching models address the software life cycle (Boehm, 1981; Royce, 1970), programming (Schubert & Schwill, 2011), and project management methodologies (Schwaber, 2007). Because of the rapid improvements of technology methods and needs, strategies and teaching paradigms are changing and adapting within the discipline. For instance, extreme programming (XP) (Beck, 2004) and agile methods (Agile Manifesto, 2001) have influenced teaching. Technology has enabled the exploration of alternative pedagogies such as flipped classrooms, massive open online courses (MOOCs), gamification, enhanced student engagement through social media, connected learning, and, indeed, the whole field of online education (Bell, 2010; Cheong, Filippou, & Cheong, 2014; Computing Research Association, 2013).

Even though the volume's focus is stronger on IT-pedagogy in a general sense, part II of the volume addresses the ITS-discipline-oriented challenge too.

2. The Volume's Discussions in Detail

To gain insight into current practice and applied theory, this anthology presents contributions divided into three different parts: Instruction in Higher Education, Education and Training, and Globalization and Social Media.

The papers in part I of the anthology describe IT-integrated instructional approaches used in higher education classrooms. These studies mainly focus on the way these tools are applied for the purpose of learning. They make use of virtual learning environments and highlight collaborative learning in higher education.

The second part focuses on alternative ways to prepare students for their future training needs and the challenges they will meet in their working career. These contributions describe approaches such as learning by doing, that is, exploratory learning and skills acquisition. Because of the occupational slant, service learning is used as a platform for enabling these teaching and learning processes.

The final part of the volume examines the globalization phenomena, for instance, achieving learning insights in remote areas by using social media as a tool. In addition, institutional capacity building is addressed using 21st-century education approaches. This final group of papers closes with a survey study on the status quo and the implementation of distance learning programs in distance education.

2.1 Instruction in Higher Education

The first contribution 'Adding Value with Constructivism' in part I written by **Melodee Landis** is a descriptive study of in-service teachers in a graduate class asked to design unit plans for the use of digital technologies in kindergarten to grade 12 (K-12) classrooms. The underlying theory is a constructivist model called Dimensions of Learning, originated by Marzano and Pickering (1997). The theory stresses that teachers consistently should plan activities modeled on three successive phases: acquiring and integrating knowledge, extending and refining knowledge, and using knowledge meaningfully. Learners should develop attitudes and patterns of thinking and behaving that will lead them to perform at a high level of operation. The study surveys the gamut of activities generated by the teachers and concludes that the constructivist model appears to stimulate teachers to deepen and expand their use of digital learning tools in ways that empower learners to take charge of their own learning.

The paper by **Deepak Khazanchi, Bjørn Erik Munkvold** and **Aleksandra Lazareva** proposes a contingency theory based model of e-learning. The project's target is to offer learners a balanced set ("fit") of pedagogical elements (e.g., learning task, learner engagement, learner style) and the capabilities of e-learning technologies in order to support the learning process and outcome. The chapter concludes with a discussion of the implications of the proposed theoretical model and one illustration of an "ideal profile" which illustrates how information technology capabilities can enhance and augment the learning experience of the students.

The paper by **Jeanne L. Surface, Mary T. Schlegelmilch & Phyllis Adcock** addresses the challenges, discoveries and experiences of two college professors and a technology specialist learning how to introduce and adopt collaborative technologies and digital media to develop long distance education courses. The authors apply the Participatory Action Research Cycle (PARC) model as a research approach. The model supports systemic intervention, development and change conducted within groups that examine the issue in the curriculum. Starting small has been their key to success.

The contribution of **Stefanie A. Hillen** focuses on the opportunities for integrating IT applications and tools into everyday teaching in higher education. It explores digitally supported individual and collaborative learning that includes online formative assessment as a pedagogic teaching approach. The objective is to increase student's communication during and between the lectures. Two of the underlying theories used are those of the Zone of Proximal Development (ZPD) by collaborative learning, and the cognitive tool approach (Salomon et al., 1991) to expand the reach of mind by offering students selfregulated learning tools.

2.2 Education and Training

The second part of the volume starts with the introduction to the principles of "agile training" written by **Peter Wolcott** and **R. J. Redden**. The authors use the educational strength of Service Learning, which is a form of experiential learning. The technique "agile training" is developed to facilitate learning in chaotic and uncertain settings typical of microbusinesses. Students in information technology courses work with microbusinesses to apply technology to bring out positive development outcomes. As a result, they teach not only skills to entrepreneurs, but also affect positive change in entrepreneurs' attitudes toward technology.

The contribution by **Morten Goodwin, Christian Auby, Rune Andersen** and **Vera Barstad** addresses the task of training programming students for industry. They look at how one can facilitate an industry-like environment for university programming classes on automated testing of student assignments. They implement and test a prototype in cooperation with industry as a part of their basic programming class. The instructors offered authentic learning situations by different assignments, and by the evaluation of code similar to test-driven development applied in industry.

Victor Winter's paper presents an approach called "Bricklayer" that addresses the challenge of supporting students in learning programming. Bricklayer provides a suitable programming environment for a curriculum spanning multiple grades. Students can engage in coding activities at five different levels of increasing sophistication which is aligned with the idea of spiral curriculum of Jerome Bruner (1990).

The contribution by **Paul J. A. van Vliet** about the redevelopment of an information systems development course for online education describes the process undertaken to redevelop a face-to-face course into an online course. This redesign took the student-centered learning approach, in which the educator facilitates, coaches, and mentors students to actively engage in the course materials. Important to this course approach were the roles teachers and students had to assume. Even if the instructor incorporates the traditional role like developing course materials, teaching, grading exams and assignments, he also played the role of a project manager. This was the same for the students. They have to attend lectures and take exams, but they also assumed the roles of systems developers responsible for communicating with their clients and their project manager.

In their paper **Rune Andersen, Andreas Prinz** and **Halvard Øysæd** question whether and how to teach habits. They look closely at methods for teaching habits, and at the use of digital media to teach the topic of project management. They relate their concept to Bloom's taxonomy (1956).

2.3 Globalization and Social Media

Sven Å. Bjørke's paper on the education for sustainable development by online learning discusses the challenge of preparing students for an increasingly globalized and changing world with severe ecological challenges. The approach he proposes is called

transformative pedagogy. A transformative pedagogy demands analytical and context-related skills with increasing focus on learning processes, improvisation, adaptation, critical reflection, information literacy and creativity as well as collaborative learning. Managing conflicts and applying various tools and heuristics in solving previously unknown problems must also be a part of the training.

Jeremy Harris Lipschultz conducted a case study on social media communication in the classroom using a social network analysis (SNA). This was related to a participation and initialization of a service learning seminar at UNO. In general, the use of social media in classroom is an increasingly popular tool to explore social issues, personal influence, thought leadership, media literacy and other interests. The objectives in his research were blending computer-mediated communication (CMC) – which are core concepts of identity, interaction and online community – to examine three aspects of online communication behavior: issue awareness, engagement activation, and fundraising donation behavior. The main focus of Social Network Analysis lies in theorizing on social interaction and in the analysis of social interaction.

Godfrey Mayende and co-authors present a study which make use of a survey on online learning in higher education institutions in Uganda. It addresses the questions of modes of delivery of distance learning, the level of ICT integration in the teaching and learning as well as it examines the challenges which hinder the use of ICT in the teaching and learning. Overall, the survey showed the need to systematically integrate ICTs in different educational activities.

3. Challenges Made Visible, Preliminary Overarching Findings and Outlook

A look at the cross-cutting themes of all papers may help readers digest the information in this publication. There appears to be a *natural convergence* with the results of the report of the Computer Research Association (2013), adding credibility to that report as well as to the studies herein.

The articles in this collection reflect how universal and individual is the challenge to attain a symbiosis between pedagogy and technology for the purpose of making a real difference in learning. Because these studies involved not only faculty from different departments but also from two different countries, readers will encounter a *variety of content and geographic areas* in the writings. In some cases technology is the object of instruction, in others it is a tool that facilitates traditional or newer pedagogies. Some writers target goals such as improving comprehension and technical skills development; others work for the "softer" skills such as listening, observing, organizing and deeper engagement with content, other students, instructors, and community. Still others focus on real-world skills such as project management, community service, collaboration, independent learning skills, self-efficacy and problem solving. The questions asked by these researchers address how the teaching and learning is happening (online, asynchronous, synchronous, community, in a virtual environment or a controlled reality) and what the teacher and student roles have become. Most seek to

offer an increased flexibility and accessibility for their target learners, who may even be located on a different continent.

The authors emphasize the need for *transformative pedagogy*, that which changes the instructional process in such a way as to result in improved learning processes and outcomes. To achieve this, many of the studies employ models, whether they be instructional or empirical. In one case, the authors actually propose their own theoretical model to use as a tool to appropriately leverage information technology capabilities. Another common emphasis is that placed on collaboration. Cooperative learning activities among students, teachers and the community using social media humanize the reforms these teachers explore. Common to some of the writers is a preference for a blended or hybrid approach involving an analysis of precisely which skills are best facilitated by technology and which are better nurtured in a face-to-face environment. This kind of scrutiny is applied as well within those courses solely offered in digital form wherein careful study of each tool is conducted to determine its effectiveness.

In all cases, the goal is explore ways to leverage digital technologies so as to add value to the instructional process. Happily, the accounts here report some success with this goal. Whether it be to expand opportunities for learners in Africa, to enhance a student's performance in his/her chosen profession or to improve a learner's independent learning skills, it is hoped that the articles here expand our readers' notions of the promise of technology-empowered learning. It is agreed by all authors that the changes must indeed be driven by learning, not technology. And while the application of digital technology for sustainable development is complex and cuts across all subject areas and fields, the efforts by these faculty serve as testimony that individuals working across the globe can, in fact, make a difference.

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I. Instruction in Higher Education

Melodee Landis

Adding Value with Constructivism – Using a Constructivist Model to Expand Teachers' Uses of Digital Technology

Abstract

This is a descriptive study of in-service teachers in a graduate class at the University of Nebraska at Omaha who were tasked with designing unit plans for the use of digital technologies in the classroom. The teachers were required to use a constructivist model called Dimensions of Learning originated by Robert J. Marzano for their planning. The aims of this study were to determine how the use of the model expanded the variety of activities and digital tools used by teachers and to acquaint readers with how teachers adapted their teaching to use digital technology for constructivist learning. The study surveys the gamut of activities generated by the teachers and concludes that the constructivist model appears to stimulate teachers to deepen and expand their use of digital learning tools in ways that empower learners to take charge of their own learning.

1. Using a Constructivist Model to Expand Teachers' Uses of Digital Technology

Perhaps the winding down of one's career is the best time to "take stock". That is, to step back and see what has been the product of many years of work in a field. What a privilege it has been to be a part of the explosion of technology tools and the exploration of what these tools can do to add value to teaching and learning. While most are energized by the promise of the new technologies, some have expressed deep disappointment in the impact of digital technology on teaching and learning. According to Alan November:

> The reason technology hasn't had the kind of dramatic effect on education that many people hoped it would have – at least, not yet – is because the pedagogy hasn't changed in most schools … Who owns the learning? If the teacher is working harder than the student … there's a problem. (as cited in *E-School News*, 2010, p. 1)

While there are many applications of technology that have assisted teaching and learning, there are some approaches that appear to make more sense than others. As I peruse the various theoretical approaches I've experienced over the years, it is the constructivist viewpoint that has taken a stronghold on my thinking. It is the theory that most directly utilizes what research tells us about cognition and about November's notion that students learn best through active engagement in their own learning.

It is my belief that the digital applications available today have the potential to improve learning if used in combination with research-proven constructivist strategies. I am certainly not alone in my attraction to constructivist uses for digital tools. Many of the theorists studying the instructional potential of technology have gravitated to the constructivist approach (Dusca, 1975; Jonassen, 1991, 2000; Strommen & Lincoln, 1992; Blumberg, Everson, & Rabinowitz, 2004). David Jonassen (2006) is among those advocating a constructivist approach with technology:

> … even though constructivism is not a design method, there are numerous reports that empirically validate the ability of innovations based on a constructivist epistemology, such as anchored instruction, problem-based learning, microworlds, cognitive tools, and simulations, to engage and support meaningful learning (abstract).

Constructivism focuses on the conceptual structures that learners build in their minds. For most of my career I've found this intriguing. As a result, two guiding questions have become central to my work with instructional technology:

1. How can technology be used to assist learners in constructing their own knowledge?
2. How can technology empower learners to perform at high levels of critical analysis?

In my view, the conceptual model that has the most potential to assist teachers to explore these questions is Robert J. Marzano's Dimensions of Learning (Marzano et al., 1988; Marzano, 1992; Marzano & Pickering, 1997). This work excites me because it calls on teachers to organize instruction so that it elicits from learners independent, high-level inquiry and production. It encourages teachers to help learners take charge of their own learning, something that is essential to the constructivist notion that, in the end, learners construct their own learning. Try as we may to structure both the activities and the content for the learning, research shows that what stays with the learner is dependent on his/her own past experiences and personal perceptions about the value and importance of the material.

During the past few years of my teaching of graduate classes in instructional technology, I have adopted an approach that required teachers to plan units of instruction that used digital media to develop student ownership in their own learning. This article examines the products of these teachers to see whether they, in fact, were able to produce plans that, according to this model, added value to teaching and learning. It is my belief that we can learn from the applications these teachers constructed.

2. Procedure

Students in this graduate class were introduced to new technology tools using the model they were going to be asked to apply themselves in the upcoming assignment. They were given a template, which is described below, to use to organize a unit of instruction that could take place in a three- to four-week period or an equivalent

amount of activities spread over a semester. This unit of instruction was called a "strand" and the assignment was titled a "strand plan." The notion here is that the students would use the model to incrementally deepen the skills used as the unit progressed. Thus, the activities proceeded as follows:

- Students were introduced to new technology tools using the Marzano model they would also use for their "strand plan."
- Students examined other strand plans that were built on the Marzano model.
- Students developed their own strand plan integrating new technology tools into the activities called for in the Marzano model.

The analysis below summarizes how the teachers in this course responded to this approach and assesses whether this model appears to promise a more substantive use of technology that adds value to teaching and learning.

3. The Model

Often, teachers plan their instruction in short-termed, discrete chunks that may not build on each other. The assignment in this instructional technology class asked them to study the Marzano Dimensions of Learning model and plan digital media-facilitated activities that responded to "dimensions" of the model, as depicted below (Marzano & Pickering, 1997).

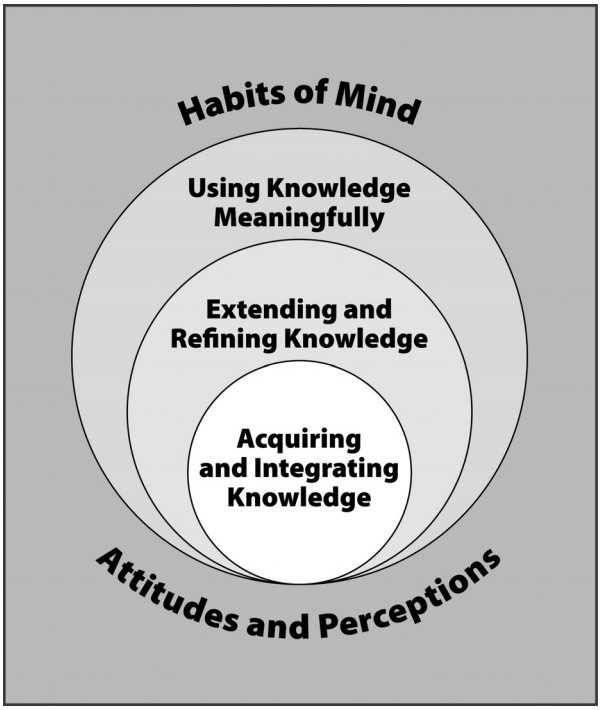

Figure 1: Marzano's Dimensions of Learning Model

The real work of the model occurs in the three middle dimensions:
Dimension 2 – acquire and integrate knowledge,
Dimension 3 – extend and refine knowledge, and
Dimension 4 – use knowledge meaningfully.

Marzano proposes that, if teachers consistently plan activities modeled on these three successive phases, learners should develop attitudes and patterns of behavior that will lead them to perform at a high level of operation. He describes the desired, larger outcomes as follows:

Attitudes & Perceptions – Learners have a positive feeling about learning environments and relationships with teachers and other learners. They feel they are capable of accomplishing learning tasks, solving problems and providing leadership when needed.

Habits of Mind – Learners are able to engage in critical, creative and self-regulated thinking on a regular basis.

4. The Study

This study's task is to inform us of how teachers plan to use technology when given access to digital tools and a model to expand their notions of how these tools can be used. The participants were mostly in-service teachers in a class on how to use technology in instruction, so no doubt the resulting plans will incorporate more technology than may be the teachers' usual practice. The assignment under scrutiny required teachers to create a plan for using digital technologies in activities described by Dimensions 2, 3 and 4 of the Dimensions of Learning model. A template was provided for them to complete. In addition to the subject, grade level, essential learning objective(s) and rationale, teachers were to fill in a matrix describing how digital technologies would be used for each of the three dimensions:

Table 1: Matrix for Dimensions Plan

Dimension 2: Identify the declarative and procedural knowledge	Major Activities Planned	Role of Media
Dimension 3: Identify the extending and refining activities	Major Activities Planned	Role of Media
Dimension 4: Selecting meaningful use tasks	Major Activities Planned	Role of Media

Teachers were also asked to add reflective comments and cite resources used. They were thoroughly debriefed on the model and had practice identifying plans using the model as well as generating sample activities for each dimension. A resource booklet was provided online that had descriptors of activities as well as verbs that could be used in objectives/activities for each dimension.

The data from the eighteen teachers' plans was analyzed using a method similar to the constant comparative method (Richards, 2005), ultimately sorting and condensing the material into general descriptors of the activities and technology used. The results