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Using Technology to Make Connections in the Core Curriculum

According to Carnegie Foundation reports (Boyer, 1987, 1990), students routinely fail to make connections between their core curriculum courses and their major courses. They do not apply the knowledge they gain in academic subjects to the challenges they face in their communities, homes, and workplaces. Complex problems often require solutions that cross academic boundaries; thus, the failure to bridge the theoretical and the concrete is at least partially due to an inability to cross academic disciplines in a coherent fashion. The results are crippling: Many students walk through a series of core curriculum courses without perceiving their interrelatedness. Students have little motivation to connect what they learn elsewhere, and students graduate with little sense of how to identify problems—much less solve them. For those who teach at institutions in which a social science course such as psychology is part of the core curriculum, these curriculum shortcomings present a pedagogical challenge.

At Southwest Texas State University, faculty members cooperatively designed an introductory psychology course that encourages interdisciplinary thinking and the appli-

cation of classroom skills to identifying and solving problems. The instructor uses readily available technology and film to improve critical thinking and application of knowledge. The course features sessions in which multimedia presentations creatively illustrate psychological content by using material from other disciplines (see Figure 1).

For example, the study of the life and work of Vincent van Gogh illustrates how psychoanalytic, behavioral, biological, cognitive, and social psychologists view one phenomenon differently (e.g., periods of artistic creativity alternating with periods of sadness and rage). Half of the screen in the lecture hall features a 15-minute video on the life and work of van Gogh while the other half depicts psychological analyses of the video content using Adobe Persuasion or Microsoft Powerpoint presentation software. As students enter and exit the lecture hall, slides of van Gogh's work fill the video side of a split screen, with one work dissolving into the next every 10 seconds, while the song "Vincent" plays over the sound system. By using interdisciplinary content and a range of learning modes, the instructor encourages students to think critically across

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Figure 1. Depiction of multimedia approach.

disciplines and helps them to transfer material learned in one domain (psychology) to a concrete problem identified in another domain (art). Table 1 lists additional key figures as well as suggests connections to traditional topics in psychology.

To engage students, the instructor divides the class into small groups of six to eight students and assigns each group a task. Each task involves a situation related to the course, but that requires thinking beyond the boundaries of the discipline. The group identifies the problem and offers a solution that draws effectively on course content. In the case of psychological perspectives and van Gogh, for example, the instructor gives each group a biographical sketch of another artist or musician. Using any of the perspectives covered in the course, the group analyzes its case, compares its findings to Vincent, and reports its findings in these terms: "Is there a personality profile that can be adequately labeled an 'artistic' temperament?"

Technical Considerations

Professors teach the course in a specially equipped classroom—a large hall that seats 388 students and is dubbed the "Teaching Theater." The theater features a Macintosh computer, an IBM-compatible computer, presentation software, VCR-slide-laser disk projection capacity, and overhead projection equipment (see Figure 1). The "theater" metaphor is appropriate because the room's design facilitates the use of film portrayals and other

audio-visual materials as integral components of teaching. The authors have experienced no problems in receiving permission for using films from the copyright holders. In fact, several studio representatives stated that formal permission was not required because the proposed use falls under the "classroom performance exemption" of the Copyright Act (17 U.S.C. Section 106[4]).

Unlike courses that use feature films in their entirety (Anderson, 1992; Barnard, 1992), strategy is for an instructor to select compelling segments of a film and combine them into a coherent clip of 10 to 20 minutes. In preparing coherent clips, an instructor is also thinking critically; thus, it is erroneous to view this approach as simply a cosmetic change in the delivery of material, with the computer and software perceived as nothing more than an electronic chalkboard. The time spent editing a film is intentional and thoughtful, and even then, the critical task of integrating a film clip with disciplinary content remains.

Once a coherent clip is complete, the professor uses presentation software to create a series of slides that apply psychological concepts to concrete experience depicted in the film clips. Using the split-screen format depicted in Figure 1, students receive both text and film simultaneously. Note that the sequence of traditional approaches to instruction is reversed: Many curriculum developers teach theoretical dimensions of material, followed by examples meant to assist students in understanding. The approach here is to begin

Table 1

Key Figures and Interdisciplinary Connections

Psychology Topic	Seminal Figure	Discipline Bridged	Sample of Materials Used and Connections Made Between Disciplines
Brain and nervous system	Stephen Hawking	Physics	<ul style="list-style-type: none"> • Film clip: "A Brief History of Time" • Hawking's effort toward "grand unification": Draw analogy to psychology's "mind-body" effort • Hawking's disease: Transition to language of neurons
Adult development	Maya Angelou	American studies and literature	<ul style="list-style-type: none"> • Video clip: "Understanding Evil" [Symposium] • Relate use of personal documents and literature to study of consciousness; use group activity to study additional early life episodes' effect on development
Cognitive and mental health	Elie Wiesel	Humanities and holocaust history	<ul style="list-style-type: none"> • Video clip: "Facing Hate" interview, Bill Moyers • Use excerpts of Wiesel reading from his own work—first night in concentration camp—to discuss concept of learned helplessness and social context of health
Current perspectives	Vincent van Gogh	Fine arts	<ul style="list-style-type: none"> • Film clip: "Vincent and Theo" and "Vincent" • Show clips of cutting ear and life events up to suicide • Analyze in terms of major psychology perspectives

with concrete experience (using the film clip) and then move progressively to more abstract, theoretical understandings. Other research studies confirm that students learn best by beginning with concrete experience and then moving progressively to reflection and abstract understanding (see Pierson, Springer, Frost, & Dorsey, 1989a, 1989b).

Simultaneous presentation is consistent with an instructional design known as the contiguity principle. As Mayer and Anderson (1992) put it, "the effectiveness of multi-media instruction increases when words and pictures are presented contiguously . . . in time or space The contiguity principle is consistent with previous educational research (Levin, 1981, 1983; Rohwer & Harris, 1975; Rohwer & Matz, 1975) and has received preliminary empirical support" (p. 444). The contiguity

principle may well reflect the coupling of concrete experience with theory: By presenting the concrete and abstract simultaneously, the relation between knowledge and life is made explicit, as are connections between disciplines.

Bell-Metereau (1983) provides other evidence suggesting the effectiveness of this approach. In evaluating her interdisciplinary English course, one that also relied on visual media (as real world, concrete experience), Bell-Metereau found significant differences between students in this course and students presented the same content but without the visual presentations. Her study is also important because it suggests that a wide range of disciplines may be able to use the approach. Table 2, for example, provides some illustrations of the approach for professors in the hard

Table 2

Making Connections: Illustrations for Natural Sciences and Technology

Discipline Taught	Seminal Figure	Discipline Bridged	Sample of Potential Materials and Possible Connections
Biology	Stephen Hawking	Physics	<ul style="list-style-type: none"> • Film clip: "A Brief History of Time" • Introduce neural system: anatomical functioning and distinction between sensory and motor neurons
Human resource development	Maya Angelou	American studies and literature	<ul style="list-style-type: none"> • Video clip: "Understanding Evil" [Symposium] • Examine general issues of diversity in workplace • Examine particular variables of gender and ethnicity as it relates to career development
Industrial technology	Stephen Hawking	Physics	<ul style="list-style-type: none"> • Film clip: "A Brief History of Time" • Edit excerpts that show Hawking in wheelchair, using computer/voice synthesizer with 1 finger • Relate to use of technology and human achievement: What if such technology was not available?
Plant physiology	Claude Monet	Art	<ul style="list-style-type: none"> • Video clip on Monet and Impressionist artists • Edit excerpts that demonstrate how different lighting conditions alter subjects; e.g., 30 paintings of a facade • Relate to key topic of light: role in photosynthesis, how light affects climate, light, and plant coloration
Any science	Socrates	Philosophy and history of ideas	<ul style="list-style-type: none"> • Video clip from Learning Channel "Classics" series • Show examples of reasoning employed by early Greek philosophers • Relate to topic of scientific method, especially in terms of inductive versus deductive reasoning
Astronomy	Early Colonists	History	<ul style="list-style-type: none"> • Video clip of American History: Boston Tea Party • Illustrate how certain historical events depended upon nighttime astronomical conditions
Human resource development	Kristy Brown	Literature and art	<ul style="list-style-type: none"> • Film clip: "My Left Foot" • Edit excerpts that show doctor and family concluding: "He'll never be able to read, write, understand, etc." • Switch to clips of a determined Brown learning to write with left foot, leading to published books • Connect to discussions of performance—motivation

sciences and technology.

Evaluation and Discussion

To evaluate further the effectiveness of specific design elements, summarized in Table 3, the authors opted for a rather innovative collaborative approach: pairing a graduate course in human performance technology with the large introductory section of psychology. The graduate students chose to study all facets of the introductory psychology course as their semester project, culminating with a presentation of findings to both instructors.

The team of graduate students videotaped six randomly selected sessions (300 minutes) of classroom instruction and used two cameras—one focused on the learners and the other focused on the instructor. This strategy allowed concurrent analysis of teaching and learning. In addition to videotaping, the evaluators administered several instruments: the Ways of Teaching and the Ways of Knowing instruments, and a learner's motivation survey (self-report, given at Week 4 and repeated at Week 14). At the end of the semester, the instructor of the large class ($n = 338$ students) and seven introductory psychology instructors who were teaching small sections of the

course (mean $n = 44$ students) provided student mid-term and final examination scores to assess learner performance. The graduate students produced a detailed evaluation report from videotape analysis, teacher-learner profiles, and performance benchmarking.

Initially, the graduate student evaluators profiled the instructor's teaching behaviors by analyzing videotaped samples and compared their analyses to the self-report inventory (Ways of Teaching) completed by the instructor. The profile obtained indicated that the instructor used all four sets of teaching behaviors equitably—concreteness, reflectiveness, abstractness, and activeness—rather than relying exclusively on any single dimension. Normally, this quadramodal approach is incompatible with large classroom instruction. The multimedia technique, however, seems to help solve the problem of one-dimensional instruction.

Next, the evaluation team assessed learners in terms of perceived motivation at the end of Week 4 and at the end of Week 14. The five motivational factors were attention, relevance, confidence, satisfaction, and performance—assessed using a 5-point Likert scale (see Figure 2). During Week 4, learners were attentive

Table 3

Pedagogical Design of the Course

Technique	Intended Student Impact	Intended Outcome
Multimedia	Hit wide range of learning modes	Comprehension
Interdisciplinary	Connect fields; broaden perspective	Integration of content
Real world context	Connect with prior knowledge	Integration with life
Interactive design	Promote active involvement	Self-directed learning
Collaborative	Promote cooperative learning	Connected learning

Figure 2. Motivation by week of semester.

and saw the material as relevant but expressed greatest concern over their ability to perform. After 14 weeks of instruction, students were still attentive to instructional material perceived as relevant although confidence, satisfaction, and perceived performance started to decline. The overall decline in motivation from Week 4 to Week 14, however, was only 7.2%. By way of comparison, the average motivational drop of the seven small psychology sections was 7.98%. This motivation data, coupled with later analysis of formal student evaluations (quantitative and qualitative), suggest that the pedagogical techniques detailed in this article best succeed in capturing student attention and making significant connections to real world issues, with no significant difference in other performance areas as compared to small sections.

The graduate student evaluators also gathered classroom data from three exams given in the Teaching Theater and exams administered in the small sections. In looking at exam scores alone, one sees a small performance gain in the small introductory psychology sections (2.19 points on a 100-point scale), but the spread of scores in the small sections was greater (standard deviation of 9.13 versus 6.36; see Table 4).

The graduate students then analyzed the exam questions and found differences in the type of questions that may have contributed to performance differences. The exam questions from the Teaching Theater section were predominantly conceptual and application questions, focusing on comprehension and ability to apply course knowledge. The exam questions from the smaller course sections placed a heavier emphasis on factual questions that required memorization. Assuming a hierarchy of learning, wherein comprehension and application represent higher order cognitive skills, one can argue that learners whose scores on conceptual questions approximate scores of learners answering memorization questions perform above the latter—even though their raw scores are slightly lower. While the argument is plausible, the wiser course is to repeat the approach documented here, but pair instructors who agree to use the same text and same exams, with exams prepared by colleagues not involved in the study and with the instructors blind to specific test questions.

Overall, the results suggest that by using an interdisciplinary multimedia pedagogy, it is possible to teach large numbers of students effectively—without eroding student motivation and in a manner that encourages students

Table 4

Performance Data

Class Type	No.	N	Avg. Size	Mean	SD	GAIN
Large multimedia	1	338	338	71.37	6.36	
Small lecture	7	308	44	73.56	9.13	2.19

Figure 3. Model of interdisciplinary multimedia pedagogy.

to make connections with other courses and with life. This pedagogy also facilitates use of a wider range of teaching behaviors that, again, seem to contribute to maintaining higher levels of student motivation. As discussed above, however, it is best to defer judgment of whether students in the Teaching Theater environment outperformed students in the smaller course sections, because graduate evaluators

found clear differences in examination strategies. In addition, other researchers might wish to explore the following question: If one adopts the interdisciplinary multimedia pedagogy outline here (see Figure 3) for use in small classes, wherein a seminar style of instruction was used in tandem, would we see additional gains in such a context?

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