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Editorial

Creativity

Donald G. Perrin

The success of the Silicon Valley in Northern California began with the PC. You can trace its many roots in companies like Apple Computer, Microsoft, IBM, Hewlett Packard, Xerox, Sun Microsystems and many others. The Silicon Valley became a Mecca for innovators and startup companies. It attracted innovators, engineers, scientists, programmers, and entrepreneurs. Their products and services have expanded in to every area of commerce and education, military and government, arts and sciences, social services and philanthropic organizations. The Silicon Valley model has been emulated in many countries as we moved into the information age connected by the Internet.

Creative talent was recruited from around the world to feed the explosive growth of industries dedicated to computers and networks and programs and applications. I was there when Industry groups approached local universities with the question – can you produce large numbers of students who are creative and technically competent for our industry? And how long will it take? These were baffling questions for institutions designed to turn out the traditional product with bachelors and masters degrees. Some industries set up their own universities. Others partnered with institutions that were ready to meet the challenge. The research base on creativity was inadequate to support the demand.

25 years later there is still a shortage of creative talent in the computer industry. Some of the giants who built the industry, like Steve Jobs, have come and gone. Most educational groups are still turning out their "traditional" product, with the notable exception of distance learning which is direct more toward the "non-traditional" learner. In the interim, the economic collapse has left the educational sector in disarray with smaller budgets and many more people needing initial training or retraining.

This issue of the Journal has some new papers on creativity and performance. Hopefully this will stimulate thousands of conversations and a flood of new research and development projects. The research findings will require interpretation and validation, and ultimately they will be embedded in software and applications.

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Editor's Note: This in-depth research study has a strong foundation in theory. It builds on the collective results of a substantial body of research. It aims at higher levels of cognitive learning from Bloom's Taxonomy. Test items were carefully validated and the multiple analysis of covariance statistical design is excellent. The results are a significant contribution to knowledge of instructional design and learning styles.

The Effects of Hypermedia-Supported Knowledge Organizers on the Construction of Conceptual and Procedural Meaning in a College Classroom

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Abstract

Previous research on the use of two-dimensional graphic organizers has found that they improve the acquisition of concepts and that visual spatial learners tend to obtain increased benefits from the use of such tools. However, there is a lack of research on the effectiveness of hypermedia-supported n-dimensional organizers on the construction of conceptual and procedural knowledge. The purpose of this study was to determine the main effects and interaction effects of learning styles and learning tool (i.e., n-dimensional organizers, graphic organizers and essays—control group) on the construction of knowledge at the higher levels of Bloom's Taxonomy in a sample of graduate and undergraduate students taking a human development course. The results of the study indicate that students with an iconic mode of learning performed better in the graphic organizers and in the n-dimensional knowledge organizers groups than in the control group. Students with a direct experience mode of learning performed better in the n-dimensional knowledge organizers group than in the other two groups.

Keywords: Graphic organizers, knowledge organizers, hypermedia, hypertext, conceptual knowledge, procedural knowledge, learning styles, schema theory, Dual Coding Theory, constructivism.

Introduction

Web-based technology has experienced an increased presence in post-secondary education, making hypermedia and hypertext variables to be considered in the process of meaningful knowledge construction. Because no significant main effects in the analysis of these variables was found in the past (Dillon & Gabbard, 1998, Chen & Rada, 1996), researchers have suggested the analysis of other variables such as learning style (Melara, 1996). The purpose of this study was to identify the impact of hypermedia-supported knowledge organizers on the construction of knowledge at the higher levels of Bloom's Taxonomy and to determine whether learning styles has a moderating role.

To promote higher-level thinking during schema construction, educators have used learning tools such as graphic organizers and concepts maps because they help students to visualize the concepts that are being learned as well as the interconnections that exist among them. Research has shown that these tools increase comprehension of subject matter (Boyle & Weishaar, 1997; Gardill & Jitendra, 1999; Ozmen, 2011; Zollman, 2009). However, because these two-dimensional representations are static, they are better at depicting declarative or conceptual knowledge and provide limited opportunities for the expression of procedural knowledge, which is of crucial importance in problem solving and in schema construction at the higher levels of Bloom's taxonomy. Procedural knowledge entails an understanding of how theoretical concepts can be implemented in concrete situations and, therefore, contain verbal as well as imagery components that cannot always be depicted through the use of static learning tools.

Hypermedia technology provides new ways of incorporating verbal and nonverbal representations of learning in a dynamic fashion. Thanks to its hypertext capabilities, this computer-based learning environment equips students with an unlimited amount of space to freely depict connections between declarative and procedural components of knowledge. Although hypermedia provides boundless possibilities for active learning, it has been primarily used to help students explore existing sources of information. In this study, however, its potential to facilitate knowledge construction through the authoring of n-dimensional knowledge organizers was explored.

Schema Theory and the External Representations of Cognitive Structures

Students have an active role in the construction of new meanings, a process that uses schema as building blocks (Bredo, 2000, Derry, 1996). Schema theory assumes that prior knowledge is being rebuilt on the basis of new evidence (DiSibio, 1982), which is consistent with the Piagetian notion of accommodation, and has played an important role in setting the groundwork for advance organizers (Ausubel,1963). Because schemata include not only conceptual content, but also procedural information that specifies how knowledge is to be used (Rumelhart, 1980), instructional approaches that promote the meaningful construction of knowledge must focus on both. Schema theory shares with the Dual Coding Theory the belief that knowledge is a composition of propositional and picture-like elements (Simon & Kaplan, 1989). In a meta-analytic study, Vekiri (2002) found that the combination of visual and verbal information improved problem-solving performance.

"Graphic organizers" is one of the names given to the "visual displays teachers use to organize information in a manner that makes the information easier to understand and learn" (Meyen, Vergason, & Whelan, 1996, p. 132). With roots in schema theory, they provide representations of mental structures that facilitate the organization of knowledge (Cooper-Shaw, 1991). Based on their specific characteristics, knowledge maps have been referred to as concept maps, mind maps, cluster maps, concept circle diagrams, semantic networks, graphic organizers, or conceptual graphs, among others (Fisher, 2000a). One of the pioneers in this field is David Ausubel, whose Meaningful Learning Theory stresses that learning of new information is linked to existing knowledge and that the concreteness of mental models could be increased through the use of a graphic tool that he called "advance organizers" (1960, 1963, 1968). He pointed out that learning and memory can be enhanced when associations among cognitive structures are expressed using a visual format. His hypothesis was that cognitive structures are organized hierarchically with inclusive conceptual resources at the top and subsuming, more specific information, at the bottom. The purpose of an advance organizer is to provide a system that can organize the new information in a unified structure that provides logical links between new and existing content (Mayer, 1980, 2010).

Based on various theoretical approaches, including the Dual Coding Theory, Schema Theory, the Cognitive Load Theory, and Ausubel's Meaningful Learning Theory, concept maps were created in the 1960s at Cornell University to help students develop visual representations of knowledge structures (Novak, 1980, 1990 a, 1990b, 1996; Novak & Gowin, 1995). These tools graphically represent meaningful interconnections among schema expressed in the form of hierarchical semantic networks. Rather than promoting passive memorization, concept maps encourage the active and creative identification of interconnections among concepts and the association between new and previous knowledge. Visually, concepts are normally enclosed in circles or boxes, and the relationships between concepts are indicated through the use of connecting lines. General, comprehensive, abstract concepts appear at the higher levels of the hierarchy and specific concepts, examples, objects and events can be found at the lower levels. Because they intertwine images and semantic content, as the Dual Coding Theory suggests, concept maps represent an effective learning and planning tool (Cicognami, 2000). In this regard, they are similar to mind mapping, a technique for taking notes that resembles a tree seen from the top, which activates the two halves of the brain—the left side performs logic functions and the right side creates artistic spatial images (Buzan, 1976, 1993; Svantesson, 1992). They also resemble the spatial method used by Naveh-Benamin, McKeachie, Lin & Tucker, 1986) to represent the relations among verbal and imagery that had the shape of tree diagrams in which higher-level words are at the top, specific terms at the lowest level, and lines connecting words represent class-inclusion relations between subordinate and superordinate elements.

In addition to emphasizing the usefulness of pictorial elements, research has shown that experts are better at retrieving information because they display a hierarchical organization that includes procedural knowledge (Eylon & Reif, 1984; Reif & Heller, 1982). There is evidence that novices can be trained to develop these hierarchical structures and, thus, search for information more efficiently and become better problem solvers (Bagno and Eylon, 1997; Eylon and Reif, 1984; Mualem and Eylon, 2010). Traditional knowledge maps are useful in helping students represent conceptual knowledge, that is, facts, concepts and objects (Stoyanov & Kommers, 1999). However, they provide few opportunities to incorporate either procedural knowledge or contextual information regarding the problem at hand, both of which are important components of the problem-solving process (Hegarty, 1991; Jonassen, 2001, 2011; Norman & Schmidt, 1999; Stieff, Hegarty, & Deslongchamps, 2011). Usually, the relationships between concepts that are indicated in these knowledge maps do not provide in-depth information regarding how knowledge can be used to solve problems in specific contexts. Marshall (1995) found that schema graphs can facilitate the connection between declarative facts and procedural rules, both of which she calls nodes, by placing weights on the links that connect the nodes, allowing for easier or stronger connections when the links have higher weights. Thanks to the organization that these weightings allow, not everything that is associated with a situation is activated at the same time. However, the amount of information that can be included in these graphs is limited.

In the area of higher-level thinking, evidence suggests that external, symbolic representations of knowledge structures reduce the complexity and cognitive load involved in problem solving (Jonassen, Beissner, & Yacci, 1993; Scaife & Rogers, 1996; Vekiri, 2002) and various researchers (e.g., Novak & Musonda, 1991; Osamasta & Lunetta, 1988) have found that knowledge maps do in fact improve the problem-solving process. Lee, Baylor, & Nelson (2005) contend that for knowledge maps to enhance problem-solving performance, they must (1) combine conceptual and the corresponding procedural knowledge representations, (2) provide contextual information about the problem, (3) provide a flexible space where the learner can represent concepts, (4) indicate the magnitude of association between concept and associated processes, and (5) allow for concepts to be represented through multiple modalities. Computer software, such as Mindjet, IHCM Cmap tools, Inspiration™, Mind Manager, Decision Explorer, SMART Ideas®, SemNet, and VUE, have been developed to create digital knowledge maps that allow for the incorporation of animation, audio, graphics and text across numerous hierarchical levels. Given their digital nature, they provide a considerably larger working space and facilitate the sharing of cognitive maps (e.g., through e-mail). By incorporating more than two dimensions into a mind map, the problem-solving performance is improved because it allows for multiple representations of knowledge (Bauer & Johnson-Liard, 1993; Boshuzien & Schijf, 1998; DeJong et al., 1998; Jonassen, Beissner & Yacci, 1993; Naijar, 1998; Paivio, 1990, 2006; Tergan, 1997; Zhang, 1997). In the area of mathematics education, Santos-Trigo, Espinosa-Pérez, and Reyes-Rodríquez (2007, 2008) used dynamic software to help students identify and reconstruct mathematical relations by assembling and examining dynamic configurations of mathematical problems. They found that this type of software helps students explore relations among objects that are difficult to grasp using a paper and pencil approach.

N-Dimensional Knowledge Organizers and Learning Styles

To construct knowledge, students need opportunities that promote reflective experimentation with the physical world and interactive negotiation of conceptual conflicts. Hypermedia is a technological tool that is supported by both schema theory and Dual Coding Theory (Wang, 2003), and is aligned with constructivist practices because it allows students to control their learning processes as they interact creatively with knowledge (Duffy, 1990; Jonassen & Carr, 2000; Palumbo & Bermudez, 1994).

Hypermedia is defined as any collection of textual, graphical, visual or auditory information (Tillman, 1997). Research indicates that hypertext facilitates remembering, concept formation and understanding because the human brain works in the same associative way (Kearsley, 1988; Khalifa, 1993, 1998; Siviter, 1992; Yun, 2011). Given that the linking capabilities of hypertext assist in freeing up short-term and working memory, they prevent a memory overload and thus facilitate the passing of information to long-term memory (Sweller, 1988).

While traditional computer-based instruction emphasizes convergent thinking, hypermedia encourages discovery and divergent learning (Gall & Hannifin, 1994; Heller, 1990; McEachern, 1998). Marchionini (1988, 2008) contends that hypertext and hypermedia foster the use of higher-order thinking skills because learners have to constantly make decisions and assess their progress. Nonetheless, Joyce (1988) distinguishes between the exploratory and the constructive uses of hypertext. Students take on the role of readers and passive consumers of information when they explore and browse through the system. On the other hand, when they invent and transform the body of information based on their needs and interests, they become authors of their own learning. Nelson and Palumbo (1992) discuss three types of hypermedia uses in educational settings: knowledge presentation, knowledge representation, and knowledge construction. Knowledge presentation systems allow students to simply follow already established links as they search for information in electronic libraries. Through the use of maps or graphic browsers, knowledge representation systems help students to identify relationships between information nodes. Knowledge construction systems foster the construction of personalized knowledge through learner authoring and linking of information. According to Palumbo and Bermudez (1994) and Nelson, Wellings, Palumbo and Gupton (2001), a more constructivist environment that allows students to add nodes and links is necessary for efficient learning to occur.

Chen and Dwyer (2003) indicate that research has been done on the usefulness of hypermedia in building declarative knowledge, but that little is known about its effects on procedural knowledge and on higher-order thinking skills. In addition, the chosen way of acquiring procedural knowledge may also be dependent upon the students' learning styles (Williams, 2000), which are the preferred processing system for learning that a person has. Although there are many learning style models, one of the most researched was created by Albert Canfield (1992). His inventory identifies preferences for conditions, content, mode, and expectancy. Conditions denote preference for working with peers or alone, and preference for organization, attention to detail, knowing the instructor and authority. Content refers to orientation toward numeric, qualitative, inanimate objects, or people. Mode makes reference to the preferred way of receiving information, which includes: listening, reading, iconic and direct experience. Expectancy is the individual's expectation of success at a learning task or a job. Because n-dimensional knowledge organizers promote changes in the "mode" that students use to express the knowledge that they are constructing, this study incorporates an analysis of Canfield's third construct—mode—on the way in which students construct procedural knowledge.

The purpose of the present study was to expand our understanding of the effects of hypermedia-supported knowledge organizers on knowledge construction among college students and of the mediating effects of learning styles.

Research Questions

This study examined the differential effects of three learning tools—essays (i.e., control group), two-dimensional graphic organizers, and n-dimensional knowledge organizers—on performance on the final exam and on knowledge construction at the upper levels of Bloom's taxonomy. The effect of learning styles as a moderating variable was analyzed. The research questions that guided the study were the following:

> Is there a significant main effect among the groups using essays (control group), two-dimensional graphic organizers, and n-dimensional knowledge organizers, and a significant main effect among students with different learning styles with respect to performance on the final exam and knowledge construction after having equated the groups on the pre-test?
>
> Is there a significant interaction between treatment condition and learning styles with respect to performance on the final exam and knowledge construction after having equated the groups on the pre-test?

Methodology

Subjects. Three undergraduate and three graduate groups of students taking a human development course at a northeastern university participated in the study. These groups included a total of 164 students from the United States and Canada. Students were not randomly assigned to groups as they self-registered for classes. Table 1 provides details regarding the gender and country of residence of the students in each group.

Table 1
Students' Gender and Country of Residence

Group	Gender		Country of Residence		Totals
	Male	Female	US	Canada	
Undergraduate I	2	22	24	1	24
Undergraduate II	3	19	21	2	22
Undergraduate III	1	20	20	1	21
Graduate I	12	20	5	27	32
Graduate II	4	31	6	29	35
Graduate III	7	23	3	27	30

Instrumentation. To assess the differential effects of essays, two-dimensional graphic organizers, and n-dimensional knowledge organizers on knowledge acquisition at the various levels of Bloom's taxonomy, the following instruments were utilized.

Achievement Pre- and Posttests. Academic performance was operationalized through the use of a pre- and a posttest that measured the extent to which students mastered the course content at the lower levels of Bloom's Taxonomy. The development of the two parallel forms was accomplished by creating a set of 250 multiple-choice questions that addressed six constructs which reflected the course material, deleting or rephrasing some of the items during the content validity analysis, and then randomly dividing the questions into two sets. To obtain content validity, the 250 items were submitted to six experts in the field of educational psychology who were asked to analyze each item and to indicate, using a five-point scale, (a) which of the six constructs they believed the item was measuring, (b) how accurately they believed that the item was measuring that construct, (c) at what level of Bloom's taxonomy they believed the item was measuring knowledge acquisition, (d) how confident they were that the item was measuring knowledge acquisition at the selected level of Bloom's taxonomy, (e) whether they believed that the item should be rephrased, and, if so, (f) how it should be rephrased. Items with less that 80% agreement on points "a" through "d" were deleted. Some items were rephrased and resubmitted to the experts. At the end, the 20 items with the highest levels of agreement per construct were retained, totaling 120 items that were split into two instruments. Both forms of the test were administered to a group of 65 graduate and undergraduate education majors and their scores were correlated. The coefficients of equivalence for the six constructs ranged from .88 to .94. The forms were named "Form A" and "Form B."

Learning Tools Rubric. A descriptive scoring scheme was developed by the researcher to determine the extent to which the three learning tools—essays, two-dimensional graphic organizers, and n-dimensional knowledge organizers—reflected knowledge construction at the higher levels of Bloom's taxonomy. To achieve this, (1) the objectives of the rubric were stated, (2) scoring criteria were developed for each objective, and (3) the researcher corroborated that all the objectives were measured through the scoring criteria and that no scoring criteria was unrelated to the objectives. Content validity was obtained by asking ten experts in educational psychology whether (1) the evaluation criteria addressed any extraneous content, (2) the evaluation criteria addressed all aspects of the intended content, and (3) there was any content that should be evaluated that was not being addressed. Whenever an issue was raised, the rubric was redesigned until all six experts believed that the rubric was accurately measuring what it was intended to measure.

Learning Styles Inventory. The Learning Styles Inventory (LSI) developed by Albert A. Canfield and published by Western Psychological Services was used to determine students' learning preferences. The four areas that this instrument measures include preferred conditions for learning, areas of interest, mode of learning, and expectation for course grade. However, only the items corresponding to the construct "Mode of Learning" were used as a measure of the moderating variable "Learning Styles." This inventory examines whether the student prefers to obtain new information through listening, reading, interpreting illustrations or graphs, or through hands-on experience. Internal consistency reliability values range from .87 to .96. Split-half reliability values range from .96 to .00, and test-retest reliability values range from .62 to .78. Criterion related validity was estimated by collecting data on groups of individuals for who prior learning styles expectations existed. The validity coefficients range from .24 to .77.

Research Design. A three by four multiple analysis of covariance was conducted with treatment condition (LearningTool) and learning styles as independent variables, posttest and performance on the "Learning Tools Rubric," which focuses on knowledge construction at the higher levels of Bloom's taxonomy (i.e., apply, analyze, evaluate and create), as dependent variables, and pretest as the covariate. Treatment condition had three levels: essays, 2-dimensional graphic organizers, and n-dimensional knowledge organizers. Learning styles had four levels: listening, reading, iconic and direct experience. Because students were not randomly assigned to groups, *selection* was considered a potential external validity threat.

Procedure.

Pre-intervention. All students took the pretest at the beginning of the course in order to determine the levels of familiarity with the course content. However, not all students took the same form of the test; students whose last name started with one of the first thirteen letters of the alphabet (*a* through *m*) took "Form A" and the remaining students took "Form B." The second session was devoted to the analysis of Bloom's taxonomy and the relevance of knowledge construction at the various levels. Specific examples of performance at each level were provided and students were told that the final project—essays, 2-dimensional graphic organizers, and n-dimensional knowledge organizers—would be assessed using a rubric that looked for evidence of knowledge construction at the higher levels of Bloom's taxonomy.

Intervention. The groups that had to create an essay reviewed the elements that ought to be included in this type of written assignments and were instructed to incorporate specific examples that showed how the theories of human development could be put into practice. The groups that developed 2-dimensional products were taught how to create various types of graphic organizers including concept maps and mind maps. They were also instructed to include specific practical examples. The groups that developed n-dimensional organizers were taught how to incorporate text, graphics, audio and video with hypertext using NVU and PowerPoint. However, they were allowed to use any other type of hypermedia-based software that they were familiar with. An emphasis was also placed on the importance of including practical examples. All groups were taught by the same researcher.

Post-intervention. All students took a posttest; those who had taken "Form A" as a pretest were given "Form B" as a posttest and vice versa. They also submitted final projects—essays, 2-dimensional graphic organizers, and n-dimensional knowledge organizers—which were assessed by two experts in educational psychology using the "Learning Tools Rubric."

Data Analysis and Results

SPSS was used to perform a 3 x 4 between-subjects multivariate analysis of covariance with the sequential adjustment for nonorthogonality. The five dependent variables were Posttest, Applying, Analyzing, Evaluating, and Creating. Covariate was Pretest and independent variables were LearningTool, with three levels (essays, 2-dimensional graphic organizers and n-dimensional knowledge organizers), and LearningStyles, with four levels (listening, reading, iconic and direct experience), entered in that order. A direct discriminant analysis was performed as a follow up to the MANCOVA.

Total N was 164 and no cases were deleted, as no data was missing. There were no univariate or multivariate within-cell outliers at $p < .001$. Results of evaluation of assumptions of normality, homogeneity of variance-covariance matrices, linearity, and multicollinearity were satisfactory. Covariate was judged to be adequately reliable for covariance analysis.

Using Wilk's criterion, the combined DVs were significantly related to the covariate (Pretest), $F(5, 147) = 42.38$ $p < .01$, to LearningTool, $F(10, 294) = 2.60$, $p < .01$, LearningStyle, $F(15, 406) = 1.02$, $p > .05$, and to the interaction Learning Tool*LearningStyle, $F(30, 590) = 1.83$, $p < .01$. However, the correlation between DVs and LearningTool*LearningStyle*Level was not statistically significant, $F(30, 542) = 1.32$, $p > .05$. With regards to effect size, there was a moderate association between DVs and covariates, partial $\eta 2 = .23$, a small association between DVs and LearningTool, partial $\eta 2 = .07$, a small association between DVs and LearningStyle, partial $\eta 2 = .04$, a strong association between DVs and Level, partial $\eta 2 = .40$, a small association between DVs and LearningTool*LearningStyle, partial $\eta 2 = .08$, a moderate association between DVs and LearningTool*Level, partial $\eta 2 = .17$, a small association between DVs and LearningStyle*Level, partial $\eta 2 = .10$, and a moderate association between DVs and LearningTool*LearningStyle*Level, partial $\eta 2 = .16$.

Effects of LearningTool, LearningStyle, and Level on the DVs after adjustment for Pretest were investigated in univariate and Roy-Bargmann stepdown analysis, in which Posttest was given the highest priority followed by Apply, Analyze, Evaluate, and Create, entered in that order. Homogeneity of regression was satisfactory for this analysis. Results are summarized in Table 2.

An experimentwide error rate of 5% for each effect was achieved by apportioning alpha according to the values shown in the column labeled "alpha" of the table.

Table 2
MANCOVA Results: Tests of Covariate (Pretest), LearningTool, LearningStyle and Interaction

IV	*DV*	*Univariate F*	*df*	*Stepdown F*	*df*	*Alpha*	*Partial* η^2
Covariate:	POSTTEST	206.20**	1/151	206.20**	1/151	.01	.62
Pretest	APPLY	93.29**	1/151	0.12	1/150	.01	.41
	ANALYZE	60.20**	1/151	3.05	1/149	.01	.34
	EVALUATE	64.37**	1/151	0.16	1/148	.01	.35
	CREATE	69.67**	1/151	1.40	1/147	.001	.36
LearningTool	POSTTEST	8.97**	2/151	8.97**	2/151	.01	.09
	APPLY	5.56**	2/151	1.31	2/150	.01	.06
	ANALYZE	8.92**	2/151	1.48	2/149	.01	.10
	EVALUATE	3.24*	2/151	0.12	2/148	.01	.04
	CREATE	2.29	2/151	1.40	2/147	.001	.04
LearningStyle	POSTTEST	0.38	3/151	0.38	3/151	.01	.02
	APPLY	0.22	3/151	0.82	3/150	.01	.01
	ANALYZE	1.02	3/151	2.35	3/149	.01	.02
	EVALUATE	0.77	3/151	1.53	3/148	.01	.03
	CREATE	0.06	3/151	0.05	3/147	.001	.01
LearningTool	POSTTEST	2.00	6/151	2.00	6/151	.01	.15
by	APPLY	2.21*	6/151	2.78**	6/150	.01	.10
LearningStyle	ANALYZE	1.56	6/151	0.78	6/149	.01	.09
	EVALUATE	2.79*	6/151	1.98	6/148	.01	.13
	CREATE	0.84	6/151	1.661	6/147	.001	.07

* $p < .05$ ** $p < .01$

After adjusting for differences on the Pretest, Posttest made a significant contribution to the composite of the DVs that best distinguishes among students who participated in each of the three treatment conditions, stepdown $F(2,139) = 11.17$, $p < .01$, $\eta^2 = .09$. Students in the third group (adjusted mean LearningTool = 57.92, SE = 2.50) performed better than students in group two (adjusted mean LearningTool = 57.63, SE = 2.53), who in turn, performed better than group one (adjusted mean LearningTool = 49.27, SE = 3.00). Univariate analysis revealed that a statistically significant difference was also present in the Apply, Analyze and Evaluate measures. Students in groups two and three performed better in all three measures than students in group one (adjusted mean Apply for group one = 2.66, SE = .12; adjusted mean Apply for group two = 2.94, SE = .11; adjusted mean Apply for group three = 3.07, SE = .11; adjusted mean Analyze for group one = 2.71, SE = .11; adjusted mean Analyze for group two = 3.12, SE = .11; adjusted mean Analyze for group three = 3.18, SE = .09; adjusted mean Evaluate for group one = 2.62, SE = .12; adjusted mean Evaluate for group two = 2.81, SE = .11; adjusted mean Evaluate for group three = 2.94, SE = .11).

The multiple analysis of covariance did not indicate the presence of any statistically significant differences among the LearningStyle groups. However, there was a significant interaction between LearningTool and LearningStyle with respect to Apply. Students who preferred learning by hearing, lectures, tapes, speeches, etc. (*listening* mode of learning) scored higher on Apply if they participated in the first group (adjusted mean = 2.97, SE = .18) than if they participated in the second (adjusted mean = 2.88, SE = .15) or third groups (adjusted mean = 2.76, SE = .23). Students who preferred learning by examining, written information, reading texts, pamphlets, etc. (*reading* mode of learning) scored higher on Apply if they participated in the third group (adjusted mean = 3.18, SE = .19) than if they participated in the second (adjusted mean = 2.92, SE = .22) or in the first groups (adjusted mean = 2.72, SE = .23). Students who prefer learning by interpreting illustrations, movies, slides, graphs, etc. (*iconic* mode of learning) scored higher on Apply if they participated in the second group (adjusted mean = 3.29, SE = .22) than if they participated in the third (adjusted mean = 2.76, SE = .20) or first groups (adjusted mean = 2.46, SE = .26). Finally, students who preferred learning through direct experience and liked hands-on or performance situations, such as shop, lab, field trips, practice exercises, etc. (*direct experience* mode of learning) scored higher on Apply if they participated in the third group (adjusted mean = 3.08, SE = .24) than if they participated in the second (adjusted mean = 2.94, SE = .17) or first groups (adjusted mean = 2.51, SE = .24).

Univariate analysis of LearningTool by Learning Style indicated that only differences in Apply and Evaluate were statistically significant. Students with preference for the *listening* mode of learning scored higher on Apply if they participated in the first group (adjusted mean = 2.98, SE = .18) than if they participated in the second (adjusted mean = 2.89, SE = .22) or third groups (adjusted mean = 2.77, SE = .19). Students who had preference for the *reading* mode of learning scored higher on Apply if they participated in the third group (adjusted mean = 3.19, SE = .19) than if they participated in the second (adjusted mean = 2.94, SE = .17) or first groups (adjusted mean = 2.74, SE = .19). Students who preferred the *iconic* mode of learning scored higher on Apply if they participated in the second group (adjusted mean = 3.31, SE = .15) than if they participated in the third (adjusted mean = 2.78, SE = .16) or first groups (adjusted mean = 2.47, SE = .18). Finally, students who preferred the *direct experience* mode of learning scored higher on Apply if they participated in the third group (adjusted mean = 3.10, SE = .22) than if they participated in the second (adjusted mean = 2.95, SE = .18) or first groups (adjusted mean = 2.52, SE = .16). The univariate differences in Evaluate show that students with a preference for the *listening* mode of learning scored higher on Evaluate if they participated in the first group (adjusted mean = 2.92, SE = .16) than if they participated in the second (adjusted mean = 2.88, SE = .22) or third groups (adjusted mean = 2.37, SE = .19). Students who had a preference for the *reading* mode of learning scored higher on Evaluate if they participated in the second group (adjusted mean = 2.88, SE = .17) than if they participated in the third (adjusted mean = 2.82, SE = .19) or first groups (adjusted mean = 2.37, SE = .19). Students who preferred the *iconic* mode of learning scored higher on Evaluate if they participated in the second group (adjusted mean = 3.11, SE = .15) than if they participated in the third (adjusted mean = 2.84, SE = .16) or first groups (adjusted mean = 2.72, SE = .18). Finally, students who preferred the *direct experience* mode of learning scored higher on Apply if they participated in the third group (adjusted mean = 3.35, SE

= .22) than if they participated in the second (adjusted mean = 2.76, SE = .19) or first groups (adjusted mean = 2.47, SE = .16).

A direct discriminant analysis was performed as a follow up to the significant effect of LearningTool using Posttest, Apply, Analyze, Evaluate and Create as predictors of membership in three groups. Only one discriminant function was calculated, with an $F(2,161) = 7.86$, $p < .01$, $\eta^2 = .09$. Posttest was the best predictor that significantly distinguished the first group from the second ($F = 5.42$, $p < .05$) and the third groups ($F = 15.52$, $p < .01$).

Table 3
Mean Scores for the Pretest and Dependent Variables (unadjusted and adjusted) by LearningTool.

Test		LearningTool		
		Essays	Graphic Organizers	N-Dimensional Organizers
Pretest		4.84	4.88	5.75
Posttest	unadjusted	47.03	55.68	62.08
	adjusted	49.27	57.63	57.92
Apply	unadjusted	2.59	3.00	3.08
	adjusted	2.66	3.07	2.94
Analyze	unadjusted	2.64	3.12	3.23
	adjusted	2.71	3.18	3.12
Evaluate	unadjusted	2.55	2.88	2.94
	adjusted	2.62	2.94	2.81
Create	unadjusted	2.27	2.53	2.67
	adjusted	2.33	2.58	2.54

A priori comparisons were performed using a Bonferroni adjustment to determine whether the pattern of Posttest means for the interaction effect followed the one that was hypothesized. Students whose preferred learning mode was *Iconic* performed significantly lower in the first LearningTool group than in the second (mean difference = -18.13, SE = 4.39, $p < .01$) or third LearningTool groups (mean difference = -24.43, SE = 4.49, $p < .01$). There were no statistically significant differences between students with an Iconic learning mode who participated in groups two and three (mean difference = -6.30, SE = 4.10, $p > .05$). Students whose preferred learning mode was direct experience performed significantly lower in the first compared to the third LearningTool group (mean difference = -23.67, SE = 5.20, $p < .01$). No statistically significant difference was found in Posttest performance between students with a Direct Experience learning mode who participated in the first and in the second LearningTool groups (mean difference = -6.23, SE = 4.65, $p > .05$). Students with this learning mode performed significantly better in group three than in group two (mean difference = 29.90, SE = 5.47, $p < .01$).

In summary, after the sequential adjustment for nonorthogonality, the multiple analysis of covariance indicated that Posttest was the variable that best distinguished among students in the three treatment conditions. Students using the n-dimensional knowledge organizers performed better on the Posttest than those using graphic organizers who, in turn, performed better than the group relying on essays. The variables Apply, Analyze, and Evaluate also indicated a better performance in the groups using n-dimensional and graphic organizers as compared to those using essays. While LearningStyle did not effectively differentiate among the three groups, the interaction between LearningTool and LearningStyle had a significant impact on the variable Apply. A statistically significant interaction between LearningTool and Learning Style suggested that students with a preference for the *listening* mode of learning who participated in the *essay* group scored higher on Apply. Students with a *reading* or a *direct experience* mode of learning who participated in the *n-dimensional knowledge organizers group* scored higher on Apply, and students with an iconic mode of learning who participated in the graphic organizer group scored higher on Apply. When analyzing the interaction between LearningTool and LearningStyle from a univariate analysis perspective, similar findings were obtained. Students with a *listening* mode of learning who participated in the *essay* group scored higher on Apply and Evaluate. Students who preferred the *iconic* mode of learning and participated in the *graphic organizer* group scored higher on these two variables, and students who had a preference for the *direct experience* mode of learning and participated in the n-dimensional organizer group scored higher on these variables than students in the other two groups. While students who preferred the *reading* mode of learning and participated in the *n-dimensional organizers* group scored higher in Apply, students with this preferred mode of learning who participated in the *graphic organizers* group scored higher on Evaluate than the other two groups. Because the results provided by the multiple analysis of covariance with respect to the interaction between LearningTool and LearningStyle are only suggestive, a follow-up direct discriminant analysis with a priori-comparisons was performed. This analysis found that Posttest was the best predictor of group membership. The a priori comparisons indicated that students with an *iconic* mode of learning who participated in the *graphic organizer* or in the *n-dimensional organizer* groups scored significantly higher on Posttest than students who belonged to the *essay* group. There were no statistically significant differences between the *graphic organizer* and the *n-dimensional organize*r groups with respect to Posttest. These comparisons further indicated that students who preferred the *direct experience* mode of learning performed significantly better in the *n-dimensional knowledge organizer* group than in the *essay* or in the *graphic organizer* group and that no significant differences existed between the last two.

Discussion

This study investigated the effects of learning style (listening, reading, iconic, and direct experience) and treatment condition (n-dimensional knowledge organizers, graphic organizers, and essays—control condition) on a final exam and on knowledge acquisition at various levels of Bloom’s Taxonomy. The same instructor taught all four courses, comprised of 164 graduate and undergraduate students from the U.S. and Canada taking a human development course. Because registration to the courses depended on the students’ discretion, there was no random assignment of subjects to treatment conditions. However, an analysis of the composition of the groups did not suggest the existence of significant differences with regard to gender. Because a larger cultural and ethnic diversity was present in the Canadian groups, one Canadian and one U.S. group were assigned to each treatment and control conditions. Initial analysis of the data indicated that no data was missing and that normality, homogeneity of variance-covariance matrices, linearity and multi-co-linearity, were satisfactory.

To address the two research questions, which investigated the main effect among groups and the interaction effects between LearningTool and LearningStyle with respect to the independent variables—Posttest, Apply, Analyze, Evaluate and Create, a 3 x 4 between-subjects MANCOVA was performed using SPSS with a discriminant function analysis follow-up that included specific a-priori comparisons. The results of the MANCOVA indicated that no statistically significant differences among the groups existed with respect to LearningStyle. In the case of LearningTool, Posttest was the best factor that distinguished among the three groups, with students in the *n–*

dimensional knowledge organizers group performing better than in the *graphic organizers* group who, in turn, outperformed the *essay* group. The a-priori comparisons in the follow-up discriminant function analysis pointed to the fact that students with an *iconic* mode of learning had a higher Posttest score in the *graphic organizer* and in the *n-dimensional knowledge organizer* groups than in the *essay* group, and that no statistically significant differences in Posttest existed between students in the first two groups who preferred the *iconic* mode of learning. A somewhat different pattern was identified in the case of students with a *direct experience* mode of learning. Those who participated in the *n-dimensional knowledge organizer* group scored higher on the Posttest than students in the *graphic organizer* or in the *essay* groups, with no statistically significant differences between the last two.

Conclusion

Previous studies have suggested that the graphic representation of concepts facilitates the identification of relationships among ideas, the retrieval of information, and the connection of new information to prior knowledge (Cassidy, 1994). According to Freed (2006), visual learners benefit from this type of representations more than from the use sequential, left-brained teaching styles. In the case of college students, it has been found that judgments of interconcept relations improve with the use of graphic organizers and that students can more readily draw inferences when they use two-dimensional spaces that facilitate the communication of hierarchical relations (Robinons and Schraw, 1994). While two-dimensional representations of knowledge promote the expression of conceptual knowledge, they provide a limited framework to convey instances of procedural knowledge. Alty (2002) points out that procedural elements are important because they embody real-world scenarios that are more accurately recalled than static visual representations of conceptual understandings. Beachman, Elliott, Alty and Al-Sharrah (2002) found that learning is enhanced when materials are presented using sound and diagrams, regardless of the student's learning style.

The use of hypermedia technology allows for the incorporation of an unlimited number of static and dynamic representations of knowledge. Hypermedia, an expansion of the hypertext concept that allows for the inclusion of media and data links, provides an opportunity to match learning styles and learning methods (Mizell & Lever, 1990). Some researchers have argued that computer-based environments do not benefit all learners equally, as learning styles represent an important mediator of knowledge acquisition (Atkins, Moore, Sharpe, and Hobbs, 2001; Choi, Lee and Jung, 2008: Erka, 1998; Gallagher, 2010). While some researchers believe that hypermedia environments accommodate for most types of learning styles (Akbulut, 2008), others have found that levels of achievement using hypertext are differentially distributed across learning styles (Frey and Simonson,1990; Rourke and Lysynchuk, 2000). Liu and Reed (1994) concluded that field-dependent learners use the hypermedia environment more extensively and benefit more from viewing videos than field-independent learners. The results of this study indicate that learning styles mediate the effects of multimedia technology. Students with an *iconic* and with a *direct experience* mode of learning using hypermedia-supported n-dimensional knowledge organizers performed better on the posttest than students who used essays to construct and communicate their learning. These findings are compatible with those obtained by Avitabile (1998), who points out that students using multimedia do significantly better on measures of achievement than those being exposed to traditional approaches.

Because studies have shown that students with a preference for an intuitive, active approach to perceiving and processing information perform best in environments that foster the interaction with peers and instructors as they deal with the concrete presentation of practical information (Rourke and Lysynchuk, 2000), future research should compare hypermedia-based technology with learning environments that foster this type of interaction.

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Editor's Note: To be competitive in a rapidly evolving global economy, education and industry are seeking practitioners with creative skills to become the analysts, designers, innovators, inventors, problem solvers, and leaders for the future. This requires an emphasis on higher levels of learning and techniques to develop the creative abilities of learners everywhere.

The Web-Based Creativity Model©: A New Approach for Creativity Integration to Achieve Industry and Learning-Organization Competencies in Online Graduate Classes

Brent Muirhead, John DeNigris III and Jean R. Perlman
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Abstract

The focus of this article is a new approach to incorporate creativity in online graduate classes. A new model concept, the Web-Based Creativity Model©2012 Perlman, DeNigris&Muirhead (W-B Creativity Model©) is proposed as a guide in developing strategies. The W-B Creativity Model© concept is based on the application of web-based technology tools to a new creativity-domain concept: the online-class-creativity (OCC). Critical components of creativity and online learning objectives are integrated into three domains: (1) Student-Class Interconnectedness Creativity, (2) Integrative-Use of External Resources Creativity, and (3) Problem-Solving Creativity. An overview of how the new model might be used is discussed. The model concept is illustrated in Figure 1. Details of the proposed OCC domains are shown in Table 1.

Technological relevance to contemporary learning and communications delivery is an emergent requirement of online courses. There is a gap in the literature on strategies to use web-based current and emergent technology to facilitate classroom creativity. Course content-developers, faculty and industry trainers may be able to use the W-B Creativity Model© as a strategic guide to meet this emergent technology requirement. Included in the article are analyses of creativity definitions and research; creative applications of technology web tools (including web 2 and web 3); and competing issues of online learning organization-driven and industry-required competencies (i.e. online learning outcomes).

Key Words: creativity, creativity domains, integration, online, eLearning, graduate class, outcomebased learning, competencies, emergent technology, thought enabling technology, web based creativity model, web technology, web 3.0, web 2.0

Introduction

Creativity in the 21st Century online classroom is connected to thought-enabling technologies (Hong & Jung, 2010). Presented in this article is a new model concept, the Web-Based Creativity Model©, which may help in strategizing use of these classroom creative technologies. The discussion begins with a foundational overview-definition of creativity. Next, application of creativity relative to change resistance, and online learning competencies is discussed. This is followed with a discussion of the new model concept. The article concludes with conclusions and recommendations for further research.

Defining Creativity

The term creativity has generated a diversity of definitions. Kaufman and Sternberg (2007) defined creativity with having three elements: "First, those ideas must represent something different, new, or innovative. Second, they need to be of high quality. Third, creative ideas must also be appropriate to the task at hand. Thus, a creative response to a problem is new, good, and relevant" (p. 55). Contemporary definitions of creativity stress the ability to produce novel (original/unexpected) work that is high in quality and is appropriate (useful). The criteria establish boundaries for originality and helps individuals identify whether a product or idea is creative (Beghetto, 2010). It should be noted that writers will refer to the word innovative in the literature. It is a distinctive term and refers to the outcome of the creative process and a new product is introduced into the market place. Therefore, ideas could be novel and solve a particular problem but not evolve into an innovative entity. A common misconception is the need to be freed from the past to be truly creative. Rather, creativity builds upon past experiences and knowledge and uses them as a foundation for developing new ideas (Weisburg, 2010).

It is difficult to capture the multidimensional qualities of creativity within a single definition. The literature often highlights the positive and optimistic aspects of the term while neglecting the negative. *The Dark Side of Creativity* (2010) is an example of writers seeking to bring greater balance to the discussion by exploring the deeper assumptions and connections between creativity, morality and unethical behaviors.

For instance, there exists a tension within society between the desire for quickly producing original ideas and innovations while having fears about potential negative social consequences. Creativity requires experimentation. People are encouraged to be risk takers.There can be enormous rewards for commercialization of innovative technologies. Yet, the push for quicker results can led to tragic outcomes such as when Wall Street leaders take excessive risks with new financial products and undermine economic stability. A growing number of researchers are examining the negative and positive applications of novel ideas to acquire a deeper understanding of the nature of creativity (Baucus, Norton, Baucus, & Human, 2007).

The literature reflects a continuous effort to describe creativity. However, there remains a lack of consensus about a universal definition. A review of 42 definitions among researchers and theorists by Panagiotis and Valtanen (2010, p. 198) did identify four major essential features of creativity. The components are (1) creativity is a key ability of individual(s), (2) creativity presumes an intentional activity (process), (3) the creative process occurs in a specific context (environment), and (4) the creative process entails the generation of product(s) (tangible or intangible). Creative product(s) must be novel (original, unconventional) and appropriate (valuable, useful) to some extent, at least for the creative individual(s).

The definitions stress how creative individuals possess the intellectual abilities and independent personality that gives them the autonomy of thought to explore and even advocate unpopular ideas. They use a specific knowledge domain to produce new knowledge by taking unique perspectives on problems and identify ideas worth studying. The literature reveals the importance of having a supportive environment to reinforce and reward original thinking which has important implications for business leaders and educators who want organizational innovation (Weisburg, 2006).

Creative Individuals

Studies affirm a solid connection between hard work and being creative. A good work ethic enables individuals to have the patience and determination essential to produce solutions. Even those who are categorized genius (e.g. Mozart) had an exceptional work ethic (Howe, 1999).

Also, passion is a valuable trait. Yet, it is not an obsessive passion that compels individuals who struggle with internal issues such as self-esteem. This can cause them to lose control of the problem solving process. Rather, individuals have a passion where they freely choose a specific area of interest. This sense of freedom enables people to take unique approaches to problems, experimenting with unconventional thinking and generating new ideas (Luh & Chen Lu, 2012).

The individual's attitude plays a key role in problem solving situations. Those who are intrinsically motivated will increase the probability of being able to successfully generate novel ideas and products. Artists, writers and scientists are known for being passionate about their endeavors (Weisburg, 2006).

Creative people are effective at being problem finders by noticing what others tend to miss. They cultivate the ability to filter and select relevant ideas to solve problems. Researchers continue to investigate the cognitive skills associated with problem finding. The contemporary emphasis on spontaneity has neglected the role of problem selection and preparation. For instance, Impressionist painters in Europe were trained in academies where detailed planning was required such as selecting the appropriate historical or mythical theme. Painting would begin only after extensive experimenting with colors and making preliminary sketches (Sawyer, 2006).

This highlights the need for more research into understanding the influences of social and cultural factors (e.g. individualism) on stimulating originality (Zorana, 2009). Why are some people able to be more creative in their work? Perhaps, it has to do with the level of confidence and their mindset. Researchers tested 1300 people across diverse industries and identified six major traits that fostered creativity (Imber, 2011).

First, individuals are open to experiences and enjoy variety in their daily lives. They pursue new experiences, have strong curiosity and an active imagination that enables them to be creative at work.

Second is an individual's confidence in his or her ability to generate creative ideas, seek problem oriented tasks and have a strong belief in being able to produce the best ideas (Imber, 2011). This self-belief plays a vital role in being motivated for creative thinking.

Third, the person is resilient and able to respond positively to adversity or disappointments with a positive attitude and determination to continue working on their plans. Those who possess resilience can see value in failure or rejection and are significantly more creative at their work.

Fourth, individuals possess a confidence in their intuition (Imber, 2011). This is often called *gut* thinking or feeling that relies upon making automatic judgments. This approach is in contrast to the much slower and deliberate analytical thinking. Being confident in intuitive decisions has a positive impact on fostering originality.

Fifth, there exists a tolerance of ambiguity that translates into engaging in open ended problem solving situations and tasks. Individuals embrace ambiguity because it offers opportunities for autonomy, being flexible and working through dynamic problems.

Sixth and last, the individual is able to make cross application of experiences by drawing upon experiences not related to work as a resource to apply knowledge in new ways. Creative problem solving is a form of wisdom because individuals apply their knowledge and experience to achieve the best outcomes (Muirhead, 2011).

Research Trends and Educational Implications

Since the early 1990s, new trends have emerged in creativity research. Previously, studies involved gifted and talented individuals. Focus has changed to investigating creativity for all learners. Methodologies changed from large studies seeking to measure creativity to qualitative research in teaching and learning situations to explore social and cultural values while striving to understand how creativity arises within specific academic disciplines (e.g. communication). Philosophical dialogs became more common among writers on the nature of creativity. Greater attention was given to developing ways to characterize creativity with less emphasis on measuring it. Collaboration and social systems were examined to identify their roles in enhancing individual creativity (Craft, 2006).

The literature offers a wealth of insights and practical advice on helping distance educators (i.e. online) promote enduring creativity in their students. One of the primary traits of creative people is the ability to overcome resistance to their ideas. Sternberg (2003) related that "I have often wondered why so many people start off their careers doing creative work and then vanish from the radar screen. I think I know at least one reason why: Sooner or later, they decide that being creative is not worth the resistance and punishment" (p. 113).

Educators can prepare students to effectively manage creativity barriers by sharing personal narratives on how they effectively implemented plans in the midst of negative responses to their work. Grades and sharing positive comments can affirm quality work requiring substantial effort. Students should be encouraged to cultivate a determined mind set, which is essential for attempting difficult creative projects (Sawyer, 2012). Individuals must learn to take personal ownership of their successful efforts even when efforts are disappointing or fail. Sternberg, Kaufman and Grigorenko (2008) argued that taking responsibility involves three elements: have a clear understanding of the creative process, know when to criticize ideas, and take pride in excellent creative endeavors.

Creativity, Resistance, and Online Learning Competencies: Industry vs. Learning-Organizations

Creativity and change

There is a dichotomy between those who promote creativity and the advocacy of educational standardization when teaching graduate students (Hargreaves & Dennis, 2008). The concepts and applications of creativity and standardization can be viewed as diametrically opposed to one another. Those who are the architects of either paradigm might consider the other form of pedagogy disruptive to advancement of their preferred mental model or administrative mandate.

To better recognize creativity one must define its parameters. There are numerous definitions of creativity, but common characteristics surface and become a distillate of the many characteristics that are already identified, reviewed and evaluated (Sawyer, 2006; Sternberg, 2005). Harris (1998) suggested creativity can be fractionalized and then assembled by those who practice cognitive associations into a composite manifestation of originality. For Harris, ability, attitude and process are the components that both enable and define an individual's creative competency. In concert, one's ability, attitude, and process can interact toward distinctive marginal improvements of ideas and alteration of existing ideas. Once transformed and implemented, ability, attitude and process can manifest a tangible configuration that might generate original or imaginative outcomes.

Resistance to creativity

Resistance, acceptance or proactive initiatives toward the integration of creativity into the graduate academic setting may be skewed depending on the context, content and compliance of mandates established by an administrative mission or official (Hargreaves & Dennis, 2008). Therefore a degree of conviction and courage might accompany the introduction of creative endeavors into the graduate classroom. Creative applications within graduate online classes may be crafted in a disparate fashion and be independently of collaborative applications, unanimous academic support, and without universal review or acceptance from influential educational governance, such as accrediting agencies.

Each creative endeavor, performed by independent advocates of creativity, may become an accumulation of anomalies embedded within guided change initiatives within a closed environment. Shifts in thinking that breakaway from prior truths, previously considered valid, might challenge objective criteria and engage perspectives that were discovered through rebooting concepts using a creative lens (Kuhn, 1962) .

Contemporary online graduate classes

Challenges and opportunities exist within graduate online learning environments. These challenges and opportunities may transcend outcomes from administratively manufactured constraints, participant interaction, and orientation of learning environment constituents toward non-linear thinking (De Bono, 1992). Resistance to creativity, as a vehicle of knowledge development and advancement, can therefore be associated with the rules of engagement designed by those who govern its tangibility and applications. This resistance is also associated with those who participate in the graduate online experience exhibiting creative initiatives.

An area of graduate education that adheres to rules of correspondence between an instructor's traditional teaching scripts, academic fundamentalism, and tested process models of behavior is evident in the domain of graduate business education (Powell, 2007; Patel & Patel, 2006). As a genre of education, graduate business educators can emphasize instrumental disciplines that bring closure to outcomes and follows mechanistic thinking (Vance, 2007). Business systems, unlike static university graduate business courses, are based on the rigors of competition, turbulent markets, irregular strategies and germinal technologies. These factors contribute to a disruption of existing conventional educational models (Vance, 2007).There are possible benefits to interrelated learning by managed associations between business practices and graduate business curriculums. There are also benefits from advocacy and use of creative contemporary and future learning modalities. Ways of learning might be leveraged to promote creative thinking and business curriculum applications through new forms of educational deployment and new forms of creative technology in the online graduate classroom.

The application of creativity thought - enabling technologies

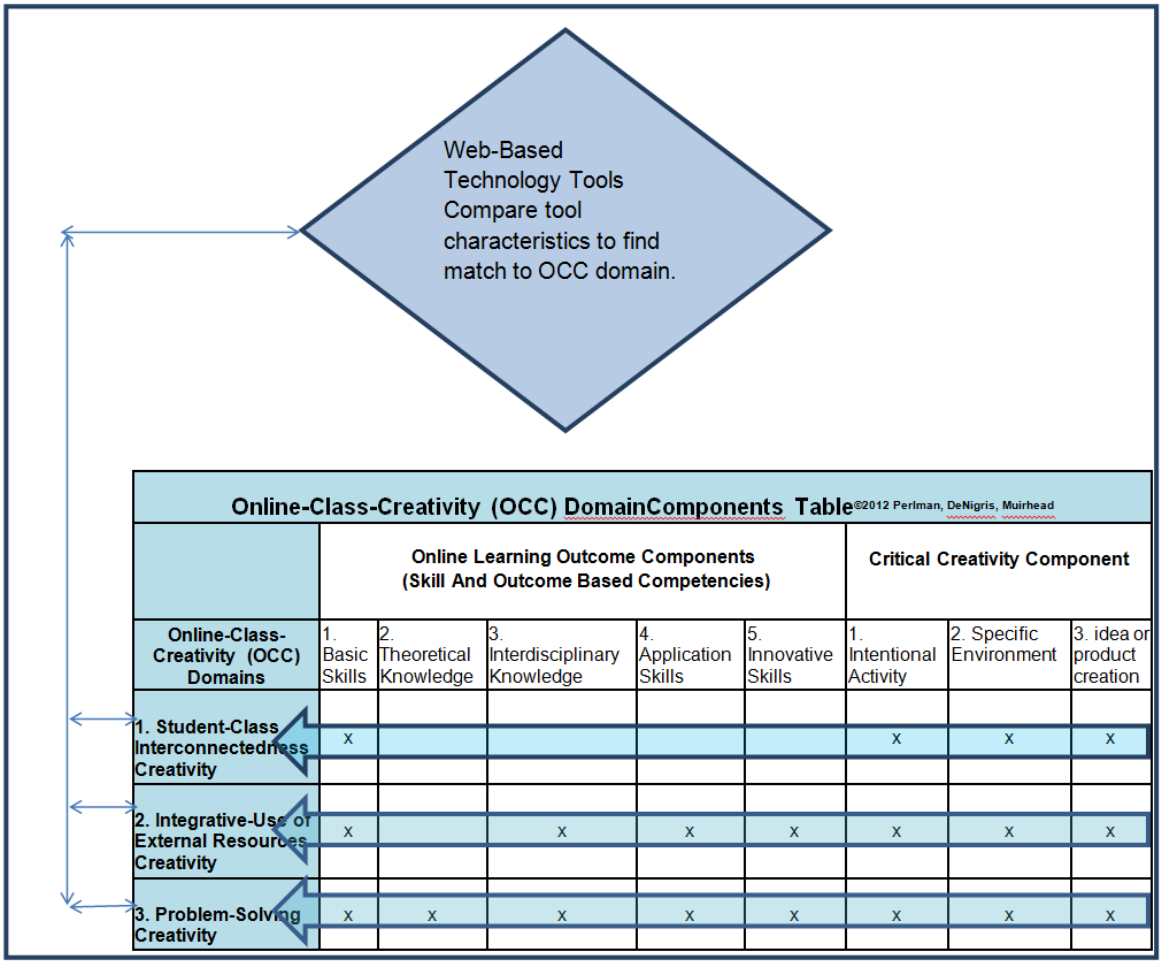
Classifying enabling technologies that might leverage online graduate learning requires purposeful inquiry qualified by desired educational outcomes (Hong & Jung, 2010). Universities are currently using online platforms for educational delivery for instrumental reasons that provide a university and its students, time, place and form utility. For example, online classes provide economies of scale as a channel of learning distribution. Online classes allow for economies of scope in terms of the educational channel's reach to broad-based and geographically dispersed audiences. Online classes also facilitate transparency of thought and reasoning for students. Additionally, online classes provide an alternative for courses not offered through traditional classroom venues (due to budget constraints or limited university offerings during its class cycles).

Technology has emancipated educational learning from geographic constraints. The opportunities created by decades of technological advancements present occasion for public and private universities to better manage student enrolment growth. New technology addresses the demands of student consumers who prefer to attend classes that afford learning platforms and configurations not available in a physical classroom. With the benefits of online graduate class offerings becoming transparent to university administrators, teachers and students; expansion of online graduate classes has gained momentum. This online class expansion has begun to parallel the growth of personal computers and mobile technology. Interestingly, there exist no universal model for technological online graduate course enhancement, nor has there been an undivided standardization of technological tools used within the online domain (Green, 2011).

Integrating Creativity in Online Classes: Web-Based Creativity Model©

Interactivity, fostered through web-based technology tools, is a foundation for integration of creativity in 21st Century online classes (Bartholomew & Glassman, 2012). There is an increasing array of technical tools which can be used to interactively engage students (Tunks, 2012). However, understanding how to use these tools for creativity in the online class to achieve online learning outcomes can be confusing.

A suggested new approach, the *Web-Based Creativity Model*©2012 Perlman, DeNigris&Muirhead is proposed as a guide for developing strategies using web-based tools to achieve creative interaction in graduate online classes. The Web-Based Creativity Model© (W-B Creativity Model©) concept is illustrated in Figure 1. The W-B Creativity Model© is based on the application of web-based technology tools to a new creativity domain concept: the *online-class-creativity* (OCC).



Online-Class-Creativity (OCC) DomainComponents Table©2012 Perlman, DeNigris, Muirhead	Online Learning Outcome Components (Skill And Outcome Based Competencies)					Critical Creativity Component		
Online-Class-Creativity (OCC) Domains	1. Basic Skills	2. Theoretical Knowledge	3. Interdisciplinary Knowledge	4. Application Skills	5. Innovative Skills	1. Intentional Activity	2. Specific Environment	3. idea or product creation
1. Student-Class Interconnectedness Creativity	x					x	x	x
2. Integrative-Use of External Resources Creativity	x		x	x	x	x	x	x
3. Problem-Solving Creativity	x	x	x	x	x	x	x	x

Figure 1: The Web-Based (W-B) Creativity Model Concept©2012 Perlman, DeNigris&Muirhead

The OCC domains are shown in Table 1. Three domain categories are proposed: (1) Student-Class Interconnectedness Creativity, (2) Integrative-Use of External Resources Creativity, and (3) Problem-Solving Creativity.

Incorporated within each of the OCC domains are key components of online-learning and creativity. Shown in Table 1 is a breakdown of respective components associated within each OCC domain. Listed in Table 1 are three critical creativity components (Panagiotis &Valtanen, 2010;Weisburg, 2010). They are

1. intentional activity within a
2. specific environment
3. producing new ideas and/or products.

Also listed in Table 1 are online-learning outcome components generalized into five skill and outcome based competencies. Incorporated are both learning-organization required and industry-required competencies (Hong & Jung, 2010; Jackson, 2010; Sun, Tsai, Finger, Chen & Yeh, 2008; Vaatstra & DeVries, 2007). Included in the competencies are

1. **Basic Skills** - speaking, writing, self-motivation, organization, time management,
2. **Theoretical Knowledge** - understanding of course foundational content,
3. **Interdisciplinary Knowledge** - thinking and problem-solving across different degree disciplines,
4. **Application Skills** - problem solving ability to real world industry issues, critical thinking, and
5. **Innovation Skills** - the ability to bring value-added outcomes to real world industry issues, creative thinking.

Table 1
Online-Class-Creativity (OCC) Domain Components

ONLINE-CLASS-CREATIVITY (OCC) DOMAIN COMPONENTS TABLE ©2012 PERLMAN, DENIGRIS, MUIRHEAD								
Online-Class-Creativity (OCC) Domains© An overview of each domain is presented below[3]	**Online Learning Outcome Components**[1] (Skill And Outcome Based Competencies) [1]Based on research by Hong & Jung, 2010; Jackson, 2010; Sun, Tsai, Finger, Chen & Yeh, 2008; and Vaatstra & DeVries, 2007					**Critical CreativityComponents**[2] [2]Based on research by Panagiotis&Valtanen, 2010 and Weisburg, 2010		
	1. **Basic Skills**: speaking, writing, self-motivation, organization, time management	2. **Theoretical Knowledge**: understanding of course foundational content	3. **Interdisciplinary Knowledge**: thinking and problem-solving across different degree disciplines	4. **Application Skills**: problem solving ability to real world industry issues, critical thinking	5. **Innovative Skills**: value-added outcomes to real world industry issues, creative thinking	1. **Intentional Activity**	2. **Specific Environ-ment**	3. **idea or product creation**
1. Student-Class Interconnected-ness Creativity	X					X	X	X
2. Integrative-Use of External Resources Creativity	X		X	X	X	X	X	X
3. Problem-Solving Creativity	X	X	X	X	X	X	X	X

[3.]OCC Domains©2012 Perlman, DeNigris, Muirhead

Student-Class Interconnectedness Creativity The first web-based creativity domain involves interconnectedness of the student to the class. Student engagement includes both classroom discussion and creative application. Examples of these kinds of tools include blogs, wikis, video and social media (Avci & Askar, 2012).

Integrative-Use External Resources Creativity The second web-based creative domain involves the use of integrating external resources. An example is an RSS aggregator. The term RSS aggregator refers to a web based system where information from the web is filtered from multiple blogs and organized into categories (Glotzbach, Mordkovich & Radwan, 2008). The user is therefore able to target specific content information.

Problem-Solving Creativity The third web-based creativity category involves problem-solving. Through immersive and interactive simulations and games, such as virtual worlds (an example is Second Life), students make choices which in turn dictate the path and challenges presented in the simulation (Bojanova& Pang, 2010).

W-B Creativity Model© Technology Connection

The term *web-based* (W-B) in the Web-Based Creativity Model© is a reference to software and hardware technologies supported by the internet (web). These web tools facilitate the creativity application through thought-enabling technologies discussed earlier.The evolution of the web is a continuing growth of interactivity with extensions into work, leisure, and school life. Web evolution has developed from a primarily research tool to an interconnected global community where people create, share, revise, and communicate (Yuen, Yaoyuneyong& Yuen, 2011). An example is web software which recognizes and interprets a user's preferences and search to customize a user's experience. Other examples are ease-of-use communications (such as email, Facebook, twitter, etc.), file creation and sharing (such as documents, films, videos, etc.) and alternative environments (such as virtual reality, 3-D and learning games environments, etc.).

This technology evolution is incorporated into the W-B Creativity Model© via a categorization of technology tool characteristics reflecting classroom creativity strategy use. Since it is the descriptions which are matched to respective OCC domains, both existing and *future* web-based tools are incorporated within the mode. Clarification of this concept and examples for each OCC Domain are discussed below.

1. Student-class interconnectedness creativity domain

The first web-based creativity domain involves interconnectedness of the student to the class. Student engagement includes both classroom discussion and creative application. Examples of this kind of tool include blogs, wikis, video (such as iPod casting) and social media (such as twitter and YouTube) (Avci & Askar, 2012). Use of these connectivity tools facilitates creativity and both asynchronous and synchronous participation.

Blogs are a web-based method of online community-interaction in which a topic can be written about and discussed. The content can be written by anyone or any entity. For example; an individual (such as a faculty member, or a student), a student team, an interest-group, etc. can sponsor, manage, and/or write a blog (Avci & Askar, 2012). Blogging provides a creative approach where students can reflect on what they are learning, share knowledge, debate concepts, and develop their own creative ideas.

In comparison, *wikis* are not discussions by an individual. Instead, the information reflects a collaborative effort (Kohli & Bradshaw, 2011; Avci & Askar, 2012). The content can be revised by anyone who has access to the Wiki. Anyone can add or remove information. Research (Avci & Askar) indicates that while both blog and wiki applications are effective creative tools, students prefer wikis. This preference may be due to the greater flexible use of wikis. Creatively, wiki use facilitates team collaboration. For example, teams can work together on editing and peer review projects.

Videos and social media (such as twitter and YouTube) offer alternative ways to communicate (Rodriguez, 2011). Use of these tools facilitates more effective communications with students and faculty who have different learning and content sharing styles. In an increasingly global make-up in 21st Century classrooms, use of this media can transcend cultural and language disconnects.

2. Integrative-use external resources creativity domain

The second web-based creative domain involves the use of integrating external resources. An example is an RSS aggregator. The term *RSS aggregator* refers to a web based system where information from the web is filtered from multiple blogs and organized into categories (Glotzbach, Mordkovich&Radwan, 2008). The user is therefore able to target specific content information. Two example aggregators, which provide subject and industry filtering, display (on one page) headline stories and videos across multiple industries are: http://popurls.com/ and http://newsonfeeds.com/

3. Problem-solving creativity

The third web-based creativity category involves problem-solving. Through immersive and interactive simulations and games (such as virtual worlds, an example is *Second Life*) students make choices which in turn dictate the path and challenges presented in the simulation (Bojanova & Pang, 2010). Use of this creative approach to teaching content can also facilitate development of critical thinking skills. Developing creativity approaches using simulations is particularly relevant in graduate classes. On the graduate level, student outcomes involve more than learning tasks (Magana, Brophy & Bodner, 2012). By introducing scenarios dependent on student choice, content learning is more student-centered learning. Learning goals include the ability to respond to real-world situations. These skills transcend to career employability success.

Four W-B Creativity Model© strategy steps

In application, a creative strategy is determined using the W-B Creativity Model© in four general steps. The first step is a consideration of which *Online Learning Outcome Component* (see Table 1) is wanted. This choice is made by the faculty (or other learning-leader) relative to the course assignment. The second step is identification of one or more associated *Online-Class-Creativity (OCC) Domains* (reflected by an "X" in the table matrix, on Table 1). The third step is selection of one or more web tools that support characteristics of the OCC Domain (see model concept illustrated in Figure 1).

The choice of web tool is self-directed. The rationale for the choice is given in the description of why a technology is an appropriate fit. A tool is considered appropriate if the description of the tool function matches the description of a respective OCC Domain. Since it is a matching by function description, when a new technology is introduced for the web, the new technology immediately becomes part of the model choices. The self-directed aspect of this choice contributes to a successful class outcome for the student. Engaging in self-direction is a motivator (Lee, Barker & Kumar, 2011). Motivation is a critical success factor in online education (Hong & Jung, 2010; Sun, Tsai, Finger, Chen & Yeh, 2008).

The fourth step is assessment of the final product, service, or procedure achieved by using the tools in the OCC domain. The description of the desired learning outcome can be defined in advance. This aspect facilitates a faculty's teaching approach to content delivery. Assessment could be used either in part or in whole as a graded activity.

Conclusions and Recommendations

Creativity in online graduate classes continues to be an area in which research is needed (Tunks, 2012). There is a gap in the literature on strategies to use web-based current and emergent technology to facilitate classroom creativity. A new model concept, the Web-Based Creativity Model©2012 Perlman, DeNigris&Muirhead (W-B Creativity Model©) is proposed as a guide for developing strategies. The model concept is illustrated in Figure 1.

The W-B Creativity Model© concept is based on the application of web-based technology tools to a new creativity-domain concept: the *online-class-creativity* (OCC). Critical components of creativity and online learning objectives are integrated in the OCC domains, (see Table 1). The OCC domains are (1) Student-Class Interconnectedness Creativity, (2) Integrative-Use of External Resources Creativity, and (3) Problem-Solving Creativity.

In conclusion, creativity, industry-applicable competencies, and learning-organization classroom outcomes; along with technology; are critical aspects of contemporary online classes. The evolutionary change in web technology includes an increasing flexibility, creativity, and mobility (Green, 2011). Technological-relevance to contemporary learning and communications delivery is an emergent requirement of online courses. Course content-developers, faculty and industry trainers may be able to use theW-B Creativity Model© as a strategic guide to meet this emergent technology requirement.

Research is needed to test the model. Research is also needed on which web-based tools are most effective for creativity in online classes; and whether there is a difference by discipline category. Further refinement, research and test of the model components are also recommended.

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Editor's Note: Innovation and creativity are associated with higher levels of learning in the Cognitive Domain of Bloom's Taxonomy,. These skills include analysis, synthesis, problem solving, exploration, invention, design, construction, evaluation, and related skills. Ingenious instructors can add vitality to their courses by moving beyond knowledge, conceptualization and application to tasks that inspire creativity in the search for knowledge and the interpretation of events.

Combining Creativity and Civilization:
A Natural Experiment in a General Education University Course

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Abstract

Improving creativity and innovation is viewed as an increasingly important goal for classroom instruction. This paper evaluates whether a change in creativity occurred for students participating in a university "civilizations" course in which the instructional approach focuses on lateral thinking skills, examines characteristics of world civilizations that exhibited high levels of creativity, and encourages students to practice being creative through a class project and exams. Students in the class who took the Torrance Test of Creative Thinking (TTCT) at the beginning and again at the end of the semester experienced a statistically significant change in creativity scores compared with students in the comparison group, who experienced no significant change.

Keywords: creativity, Torrance Test of Creative Thinking, curriculum, pedagogy, project-based learning.

Introduction

Discussions on public policy frequently suggest that education curricula promoting creativity and innovation is essential to solving problems related to economic development and other social issues (Business Roundtable, 2005; Council on Competitiveness, 2005; McAloone, 2007; OECD, 2004, 2008). For example, in 2009, U.S. President Barack Obama launched a program called "Educate to Innovate." This program is intended to help students excel in science, technology, engineering, and math (STEM). The assumption is that these disciplines provide students with the tools necessary to discover new solutions to existing social and economic problems. The Educate to Innovate website displays a video with prominent leaders advocating the importance of STEM education for innovation. One video clip features Steven Chu, Secretary of Energy and recipient of the Nobel Prize in physics, who endorses the value of STEM education for developing new solutions to address social issues. Chu states, "There will be Nobel Prize-caliber discoveries that have to be made in order for society to better itself. . . . As a scientist or an engineer . . . you will have the tools to do many wondrous things, which will in large part help save the world" (Chu, 2011).

Despite the current rhetoric regarding the importance of education for developing creativity and innovation, education curricula often fail to teach students how to produce knowledge and be creative (Sawyer, 2004). Instead, students are "taught that knowledge is static and complete, and they become experts at consuming knowledge rather than producing knowledge" (Sawyer, 2006, p. 42). Although researchers have explored the benefits of curricula that promote creativity (Covington, Crutchfield, Davies, & Olton, 1974; Craft, Jeffrey, & Leibling, 2001; de Bono, 1973; Feldhusen, 1983; Nickerson, 1999; Sawyer, 2004, 2006; Strom & Strom, 2002; Waring, 2009; West, Tateishi, Wright, & Fonoimoana, in press), traditional teaching strategies persist that focus on scripted communication patterns and planned discussion between the student and teacher; these methods focus on the distribution—as opposed to the creation—of knowledge and reduce creativity in the classroom (Mehan, 1979; Papert, 1993; Rogoff, 1990; Sinclair & Coulthard, 1975). Traditional approaches to knowledge distribution in classroom settings are largely a function of educational and political incentives that reward teaching curricula focused on preparing students for achievement tests rather than on student creativity, ability to improvise, or application of other problem-solving skills. Given the importance of curricula that encourage the production of knowledge, additional research is needed to better understand teaching strategies designed to facilitate and improve student creativity (Smoot, 2006; Todd & Magleby, 2004).

In this paper we conduct an experiment to examine whether principles of creativity taught in a university "civilizations" course effectively increases creativity among college students. The course is designed to examine creativity exhibited by world civilizations in arts and culture, science and technology, and politics and uses examples from world civilizations to illustrate and teach principles of lateral thinking and to help students apply the principles of lateral thinking when completing assignments and exams. We assess whether a change in creativity occurred among students enrolled in the course using the Torrance Test of Creative Thinking (TTCT) (Torrance, 2008).

Course Overview

The civilizations course under investigation is entitled "History of Creativity." The course was developed by one of the authors, and it is taken by students with diverse academic majors, including engineering, the natural sciences, and the social sciences. The creativity class is a general education course and fulfills the civilization requirement for undergraduate students at Brigham Young University (BYU). Course content covers two semesters. Each semester focuses on one of two historical periods: pre-1500 AD and 1500 AD to the present. Material for the first semester consists of the Mesopotamian and Egyptian civilizations and the Greek and Roman Empires, among others. Course material for the second semester begins with the Italian Renaissance and ends with contemporary society. Aspects of contemporary society discussed in class include major conflicts (e.g., World War II, the Cold War, India's struggle for independence, and conflicts in the Middle East), modern arts (music, painting, sculpture, literature), and scientific and technological advances of the 20th and 21st centuries. The course is designed to emphasize aspects of civilization that are relevant across academic disciplines. To this end, the course underscores the creativity of civilizations by describing creativity exhibited in the arts, architecture, science and technology, and politics.

Course Concepts and Applications

Course content not only describes creative aspects of civilizations, it identifies general principles of creativity. The first lecture of each semester includes a discussion of vertical or linear thinking, lateral thinking, and criteria used to evaluate creativity. Linear thinking is based on logic, previous experience, and proven, sequential methods; lateral thinking refers to finding solutions by viewing problems in a new way or through unconventional approaches (de Bono 1970, 1985). Subsequent class lectures highlight examples of linear and lateral thinking exhibited in world civilizations. Linear thinking is taught by describing people and events in historical sequence. Lateral thinking is taught by comparing people, events, and cultural styles from one civilization with those same things in another civilization, such as the philosophies of Sir Francis Bacon and René Descartes, or art and architecture from the Renaissance and Baroque periods. In addition, course assignments and tests provide students with opportunities to practice being creative. Course exams evaluate both linear thinking (i.e., questions ask students to define key terms and match people and places) and lateral thinking (i.e., essay questions require comparing and contrasting people, concepts, and civilizations). Each exam includes a take home question that requires students to create a work of art, literature, sculpture, or invention within certain parameters that are pertinent to the particular time period covered by the exam. For example, the students might be asked to write a sonnet about university dating in the style of Shakespeare or, in another time period, to design a house in both the Baroque and the Classical styles and point out the differences.

Principles of creativity are also taught to provide students with a framework for evaluating the creativity demonstrated by each of the civilizations discussed over the course of the semester. These broad principles include originality and appropriateness or usefulness (Jackson & Messick, 1967; Mumford & Simonton, 1997; Runco, 2004). Originality refers to the novelty of an object or practice. Appropriateness indicates that "creative products are useful for an intended audience" (West et al., in press). Additional principles of creativity discussed in class include the concepts *intent* and *implementation*. Intent suggests that an innovation is not merely the result of serendipity, but of deliberate action. Implementation signifies that a new object is functional and its use is evident in the time period being studied.

An illustration of how these criteria are used to evaluate creativity within a civilization is the lecture on Greek versus Roman creativity. Here the instructor points out that the ancient Greeks were typically interested in original ideas and discovery of the world through science, whereas the Romans were more likely to adapt and implement existing ideas to create a better society through engineering. Examples from each culture are examined and discussed. Classes discuss whether the Romans were truly creative if their contribution was not unique in discovery, but was implemented from other civilizations, and the historical importance of social and cultural artifacts and arrangements produced by each society.

Project-based learning (PjBL) is another key element of class. PjBL is a common method for teaching creativity, especially in design and engineering education. The purpose of PjBL is to create and develop an authentic, or "real life," project that addresses a problem and provides a solution. "Designing an authentic project means that pupils define their own design problem, deal with needs, and decide on their requirements" (Doppelt, 2009, p. 57). PjBL privileges problem-solving skills and student interests over a "fixed curriculum." It provides students with direct experience instead of passively absorbed instruction. Accordingly, the role of the teacher changes from an instructor or lecturer to a supportive resource or mentor (Newell, 2003). The project for class can be the invention of a product or service, the creation of a work of art, a creative illustration of a technology, or almost any other creative work that fits the criteria used to evaluate the projects by the instructor, links to the subject of the semester in historical context and subject material, and illustrates principles of creativity. The project promotes lateral thinking by encouraging students to develop a new idea by combining their knowledge of course concepts with their intellectual interests.

The instructor and teaching assistants for this class mentor the students throughout the course. Teaching assistants spend time discussing ideas for the final project with students, and it is not uncommon for the instructor to meet and consult with 100 or more students during a typical semester to help them generate and develop ideas for this assignment. During one semester, a particular student asked the instructor for assistance in generating an idea for her final project. In this situation, the instructor typically asks three questions to determine the student's personal and intellectual interests: What is your major? What is your hobby? What is your favorite time period that was discussed for this course? The student's responses to these questions were communications, running, and the Renaissance. With the help of the instructor, the student developed an idea that combined her personal and intellectual interests. The project the student decided on was to create a running magazine situated during the Renaissance. It included advertisements, stories about key actors from the time period, and it was titled *Runaissance*.

Research Design

We expect students enrolled in the History of Creativity Class to develop greater creativity for several reasons. First, class lectures and discussions highlight aspects of civilizations that were creative (or not creative) and explore different ways civilizations could have been more creative. Second, each assignment or test requires students to generate a novel idea or object by applying or recombining ideas from the course in new ways. Moreover, students are required to explain why their ideas are novel. Third, a key element of the course includes the instructor's insistence that everyone can be creative and examples of previous students' creative projects are presented to spark ideas. Lastly, a great deal of one-on-one mentoring takes place to help students develop their ideas into creative projects.

To evaluate whether students' creativity improved, we implemented a natural experiment research design. Advantages of an experimental design include minimizing the effects of potential confounding variables and increasing the internal validity of the study. The experiment consisted of treatment and comparison groups who were evaluated using a pretest and a posttest (Shadish, Cook, & Campbell, 2002). This study constitutes a natural (or quasi) experiment since the students were not randomly assigned to the treatment and comparison groups.

The treatment group was composed of students enrolled in the History of Creativity Class. The students in the treatment group were volunteers from the class. The treatment group consisted of eight male and ten female students, each year in school or class was represented (three freshman, one sophomore, seven juniors, six seniors, and one graduate student), and students had a mean age of 23.2 years. A group of four students who were not enrolled in the class constituted the comparison group. The comparison group was composed of volunteers from the at-large university community who had never taken the creativity class. The comparison group included three males and one female student, one student was a freshman while three students were seniors, and the mean age was 23.0 years. Both groups of students took Form A of the Torrance Test for Creative Thinking (TTCT) as a pretest in September 2009 and Form B of the TTCT as a posttest in December 2009. The students in the treatment group completed the creativity class between the pre- and posttest evaluation, while the students in the comparison group were unlikely to have received any education or training that would influence their scores on the creativity test.

We collected data on student creativity by administering the figural version of the TTCT (Torrance 1974, 2008), and we compared students' scores from the beginning of the semester with students' scores at the end of the semester. The TTCT is the most widely used test for creativity (Amabile, 1996; Baer & Kaufman, 2006; Sawyer, 2012) and the TTCT pre- and posttest research design has been employed by a number of studies with reliable results (Ebrahim, 2006; Torrance, 1981). The figural version of the TTCT consists of a visual component that asks research participants to expand an existing picture, complete an existing picture, and alter a series of lines. The tests were administered by non-university personnel who were employed to administer and grade the exams. The personnel were trained in administering and evaluating the test by Torrance employees. The Torrance Creativity Index is calculated as part of the exam scoring for the pre- and posttests. We examined how the Creativity Index changed between the pre- and posttests, and compared the results for the treatment and comparison groups.

Results

To assess the extent to which student participation in the creativity class was associated with increases in student creativity, we examined and compared TTCT scores for students in the Creativity Class (treatment group) with scores from the comparison group. First, we will report the TTCT pretest and posttest scores and discuss differences between the two groups. Second, we will evaluate the change in scores between the pre- and post-tests for each group.

Results of the pretest are reported in Table 1. The mean score for students in the Creativity Class is 134. This score places students in the Creativity Class in the 99th percentile compared with the national norm for individuals of a similar age (Torrance, 2008, p. 33). The mean score for the comparison group is 120. This score represents the 95th percentile as compared with the national average (Torrance, 2008, p. 33). Students in the sample are considerably more creative than the national average as measured by the TTCT. This finding is relatively unsurprising since our sample is more educated than those in the same age group from which the national percentile was developed. Creativity research finds a direct link between creativity and education (Ai, 1999; Naderi, Abdullah, Aizan, Sharir, & Kumar, 2010).

Table 1
Pre-test Torrance Creativity Index

	Min	Q_1	Median	Mean	Q_3	Max
Comparison group	112.0	114.2	120.0	120.2	126.0	129.0
Creativity Class	107.0	124.2	136.0	134.7	142.2	161.0

The highest score among students in the Creativity Class was 161 compared with a high score of 129 for the students in the comparison group. Moreover, students in the top quartile of the Creativity Class scored between 142 and 161 compared with students in the top quartile of the comparison group, who scored between 126 and 129. This likely indicates a selection bias for the students in the Creativity Class. Students who are already more creative than average may be more likely to have enrolled in the Creativity Class. Another implication based on these figures is that because these highly creative students already score well on the pre-test, there is little room for improvement on the post-test. In other words, it is difficult for these students to improve their scores significantly, making it difficult for these students to improve their scores on the post-test.

Although the data included students with high pretest scores on the Creativity Index, the treatment group still experienced an 11.6 point increase in post-test scores compared with their scores from the pretest (see Table 2). Alternatively, students in the comparison group scored an average of 0.8 points lower than their own scores on the pretest. There is a statistically significant difference in the change in the Creativity Index between the comparison group and the Creativity Class ($t = 2.224$, p-value = 0.0378). These results suggest that the instructional activities that are part of the creativity class have a significant impact on student creativity scores. Given the predisposition of some students in the Creativity Class toward creativity as indicated by the high pre-test scores, it is all the more remarkable that the treatment group demonstrated a statistically significant increase in creativity compared to the comparison group.

Table 2
Change in Torrance Creativity Index

	Min	Q_1	Median	Mean	Q_3	Max
Comparison group	-9.0	-6.8	-2.5	-0.8	3.5	11.0
Creativity Class	-4.0	2.3	11.5	11.6	17.8	30.0

Conclusion

Can individuals learn to be more creative? Traditionally, the prevailing notion has been that creativity is a fixed individual trait or attribute that could not be improved. While there is still much debate, this view is being challenged, and many scholars across academic disciplines believe that educational programs that promote teaching and applying certain cognitive skills can increase student creativity (Ansburg & Dominowski, 2000; Cunningham & MacGregor, 2008; Davis, 2003; Scott, Leritz, & Mumford, 2004; Sternberg & Williams, 1996; Torrance, 1972). Among those who promote the view that creativity can be taught was the renowned creativity scholar Paul Torrance, who observed:

> I know that it is possible to teach children to think creatively and it can be done in a variety of ways. I have done it. I have seen my wife do it; I have seen other excellent teachers do it. I have seen children who had seemed previously to be "non-thinkers" learn to think creatively, and I have seen them continuing for years thereafter to think creatively. I have seen, heard, and otherwise experienced their creativity. Their parents have told me that they saw it happening. Many of the children, now adults, say that it happened. I also know that these things would not have happened by chance because I have seen them 'not happening' to multitudes of their peers (1972, p. 114).

The findings reported in this paper suggest that creativity can indeed be taught. Our study employs a natural experiment and the results of bivariate statistical analysis provide evidence that pedagogy can increase students' creativity. We find that students enrolled in a university civilizations course that examines characteristics of creativity exhibited by world civilizations significantly increases creativity in students enrolled in the course, while students in a comparison group experienced no increase in creativity. Although this class does not explicitly teach students how to be creative, student creativity increased in these students as a byproduct of learning to identify creative principles and having opportunities to put those principles into practice. Furthermore, despite the long history of creativity research, future education researchers should consider using experimental designs, which remain underutilized (Gersten, Baker, & Lloyd, 2000; Gersten, Fuchs, Compton, Coyne, Greenwood, & Innocenti, 2005; National Research Council, 2002).

It is critical to teach skills that improve creativity to keep pace in today's ever-changing global landscape. Although there are obstacles to teaching creativity in the current educational system, which is more adept at transmitting static knowledge than teaching students how to analyze and generate novel solutions to problems, it is imperative that we make creativity research and curricula a larger part of our social and policy agendas. It is not only critical to continue to find new approaches to teach students, but to make serious and concerted efforts to implement current knowledge about increasing creativity and updating antiquated educational programs that inhibit creativity.

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Editor's Note: Group learning, whether classroom or online, requires skill in planning and implementation. This paper is an excellent study of the pedagogical process required to succeed with differing content, students, and learning situations.

Structuring Group Activities for Success in Online Courses

Dan Keast
USA

A teacher introduces a group activity to her class of History students, provides necessary instruction on the topic, and then divides the students into groups. After her students move their desks into pods so they can work together, she explains the roles of each member. Once the students know what the objective is, who is in their group, and the role of each group member, they start the activity. A worksheet is distributed for students to refer to during the task. The teacher monitors the work as she walks around the room providing motivation, clarification, and redirection to off-task groups or individuals.

While walking about the room, the teacher praises exemplary work to the class which assists in motivating and directing other groups toward a common goal. As the time period for the activity nears an end, the teacher reminds the students of the approaching deadline.

When the time for group work ends, the students share their productivity as evidence of their collaborative learning. The teacher is able to view student learning, assess individual contributions, praise groups for their collaborative learning, and correct misinformation if necessary.

Close your eyes for a moment and envision this group activity occurring in a traditional classroom. Now, try to imagine it in a virtual (online) surrounding. Why would an online group activity be structured any differently than in a face-to-face classroom? The answer is that it should be fundamentally the same. The differences are the physical distance and asynchronous nature of the online classroom.

I teach using a constructivist philosophy, so I have a natural affinity for small group work in all my classes: face-to-face, blended, and online courses. Over the years I have experienced everything from amazingly successful groups to complete disasters. My approach to helping the groups has gone from hands-off/let the groups find their way, to constant replying to postings in each small group's private discussion board. Both extreme tactics ended in failure, the result being under-motivated students in the "hands-off" scenario, and overburdened ones in the "micro-managed" approach. The key to the success of small groups is not the faculty-student interaction, but the structuring and preplanning of the activities to engage consistent, quality student-to-student interaction.

For the purposes of this article, I will alter the definition of *group work* supplied by Huber & Huber (2008, p. 113): "There are two options for organizing learning in small groups on an external level: a product-oriented approach known as collaborative learning and a process-centered approach known as cooperative learning." Thus said, the scenario above is an excellent example of *collaborative* learning. The teacher could have placed more value onto the process and deemphasized the product to create a *cooperative* learning activity. I have realized the most success in a blended model of collaborative and cooperative learning wherein I value not only the product, but the process of the group activity.

Problems with Small Groups

Group work is synonymous, in some students' opinion, with one person doing all the work while the rest get the credit. "Notorious negative effects of this kind of organization of team learning are 'social loafing' and the 'sucker effect': those students who believe that they are responsible for the group's task and do the job again and again, will probably experience a decline in motivation" (Huber & Huber, 2008, p. 114). When educators create the oversight and follow-through of the group work strategy with a solidly executed role-assignment strategy, the loafing will diminish. The free loaders, free-riders, or social loafers are students who contribute little or nothing to a small group project, coast on the coattails of the worker bees, and yet expect to receive an equal portion of the grade. The engagement of the social loafers will decrease the likelihood of other group members feeling the need to do more than their role prescribes in order for the project to succeed.

One method I suggest is to create an atmosphere of *espirit de corps*. "Students must realize they are linked together in such a way that no one can succeed unless they all do and they must actively coordinate their efforts to facilitate each other's learning" (Johnson & Johnson, 1990, p. 175). Once students realize they need each other to succeed, they will become cheerleaders for one another and encourage each other to achieve more.

Students are humans and their schedules are subject to the same emergencies we face as faculty. Children get ill, cars break down, and plumbing problems occur. The issue is not that these events occur, but how they affect the group members' ability to complete a project. The students need to learn to adapt and collaborate to minimize the effects of these events on the group. Punishing the group for procrastinating is not the best solution. Encouraging stepwise progress toward the goal with rewards placed in the grading rubric might be a better strategy for a faculty member to utilize.

I strive to link the roles of a team project, so much so that each member depends on another for a component. Students "develop a sense of psychological interdependence and group identification and a feeling of personal responsibility to contribute to the group" (Gillies, 2003, p. 36). Students find failure distasteful and thus work hard to avoid it. If one student realizes that they must complete their role in order for the rest of the group to succeed, they are more motivated and inspired to participate. A sense of teamwork will emerge and reduce the freeloading effect.

Of course, there will be exceptions, and these cases will frustrate educators. In those instances, I use a part of my rubric to highlight the grading process. Instead of grading only the product, "we want instead to demonstrate that each team member has benefited personally, has gained new experiences, knowledge, and skills as individual products of his or her learning efforts, and is able to contribute individually to the socio-cultural dimension of knowing" (Huber & Huber, 2008, p. 114). Thus, I strive to create grading rubrics for the projects that acknowledge each team member's role in the process of the group activity.

Another complaint of students in the online community is that communication in an asynchronous learning environment can be slow and lead to frustration within teams. Educators should remind students of group skills within the first stage of the assignment. "The social skills that have been identified that facilitate communication include: listening to each other during group discussions; acknowledging others' ideas and considering their perspective on issues; stating ideas freely; resolving conflicts democratically; sharing tasks equitably; and allocating resources fairly among group members" (Gillies, 2003, p. 36).

The first ever ecumenical council, the Council of Trent, took place from 1545-1563 and was a legendary meeting of an estimated 255 Roman Catholic bishops from around Europe. The meeting was convened in order to address the Protestant Reformation. One of the topics of interest during the Council was that of music to be used in the church: monophony or polyphony. The initial reaction of many bishops was to clarify the text by returning to monophony completely and banning polyphony from the church - in a sense, killing polyphony! They chose not to eliminate it, but to provide guidelines governing polyphony's use in the church service. The Council's suggestions remained mostly intact until the second ecumenical council - Vatican I in 1868!

I hear a similar problem in today's church services. The other day I viewed an ad in the paper for one church that specified times for worship services. However, each service had a different kind of music. One service was contemporary, another traditional, a third was gospel-style, a fourth was rock-based, and a fifth was without music. What is going on with our services - it's crazy!

For the **Renaissance Group Activity**, I demand that your small group form a Council of UTPB and solve this issue "once and for all!" You must reform the music that is used in today's church service so that it is uniform. Choose whatever religion or keep it non-denominational. Unfortunately you do not have 18 years like the Council of Trent; you have a much shorter period of time. ☺I am sure your group can come to a consensus that will benefit the church service for many years to come.

In your doctrinal output, please address **at least** 8 of the following:

- Suggested instrument(s) appropriate for service use
- Language appropriate for service
- Length of music pieces
- Number of music pieces
- Who should sing (if anyone)
- Who should play (if anyone)
- Describe the most appropriate melody
- Describe the best use of harmony
- Describe an acceptable rhythm
- Detail how many textures (layers) are tolerable
- What forms (strophic, ABA, binary, etc) are suitable

Your group will submit a draft proposal to the Pope (Dr. Keast) for his commentary and then make alterations as necessary for final submission. The draft and final proposals are worth eight points each for a total of 16 points for this group project.

Figure 1: Music History I course, Renaissance activity for small groups

I am occasionally presented with a student asking if they can "go it alone" instead of working with groups. The student will often cite instances of horrible treatment by peers or lack of oversight by an instructor. I have experienced this situation so many times that I have now included a segment in my first module of every online course that includes the rationale for collaborative learning. "Include a discussion of the benefits of group work, as well as the challenges associated with carrying out collaborative group activity in an online course environment" (Doran, 2001, p. 26). One of the benefits to online group work should be that of Slavin (1995) who found that cooperative learning led to a higher academic achievement in 64% of his 90 field studies. Von Hentig (2004, p. 11) commented that students should learn "to do their part in a world characterized by collaboration" as well as learn "to participate actively first in the processes of a small, then wide community." I tout these benefits and discuss how my work on many committees and boards produces something greater than any one person can achieve alone. Another benefit to the students is how this gives them an opportunity to develop life skills that will benefit them outside of the classroom for years to come.

Need for Structure

Rarely found in research literature before the 1970's, group learning is now a major part of American educational pedagogical processes (Slavin, 1995, p. 74). It is almost impossible to imagine a classroom in today's schools without some form of collaborative learning. The problem exists that not all teachers follow a method, such as a model provided by Arends (1988, p. 408):

Phase 1 – Present goals and set

Phase 2 – Present information

Phase 3 – Organize students into learning teams

Phase 4 – Assist team work and study

Phase 5 – Test over materials

Phase 6 – Provide recognition

Educators use various models of collaborative learning such as the Jigsaw (Aronson, 1978) or the Listen-Think-Pair-Share method (Lyman, 1981, p. 109). Regardless of the method, the need for structure is the key to success in group learning. "…It is clear that placing students in groups and telling them to work together will not necessarily promote cooperation and learning" (Gillies, 2003, p. 36). Online activities should be planned and executed much like face-to-face activities – probably even more so for the asynchronous online classroom. Group activities created by incorporating structure and scaffolding will be much more likely to achieve success than those without.

In the scenario presented earlier, the educator interacted during the activity with individual groups so as to redirect off-task groups, answer questions, and provide praise/motivation where appropriate. The online educator must monitor group discussion forums and inquire about their product to provide the oversight. Simply stating the goals and presenting information is not sufficient. The follow-through is essential, especially when students perform the activity asynchronously. Their isolation and frustration will mount if team members fail to respond quickly or do not participate meaningfully in the discussion forum.

In addition to oversight, an online educator needs to provide scaffolding for the students to use "just in time". Scaffolding "enables children to complete tasks they would not be able to do by themselves. When children work cooperatively together, the group creates a zone of proximal development enabling members to be successful at tasks that they would be unable to do alone" (Gillies, 2003, p. 39). Scaffolding is the deliberate placement of tools for students to use for investigating a topic or completing an activity. Tools for the students can be as simple as an email link to a librarian to ask for help or guidance, hyperlinks to pre-screened websites helpful for additional information, websites for skill drill, or a link to the textbook publisher's online ancillary materials. Scaffolding can also be as detailed as teacher-designed interactive self-help activities such as formative quizzes. Regardless, scaffolding activities are intended to support the students' interaction with course materials without the direct intervention of the educator.

Assigning students the task of synthesizing data and creating a summary is challenging. Organizing the students into teams and letting them flounder is not a productive use of their time. As a face-to-face educator would answer questions or point students in the right direction for answers, online scaffolding should be provided so students get immediate help in the physical absence of the educator. I provide students with possible hints or helpful links to use if they need assistance with a specific task of the group activity. I also place generalized scaffolding on a main menu that can lead the students to technical support, the campus library, job services, bookstore, advising, ADA services, tutors, counseling on campus, time management materials, and the campus writing center.

Providing teams with a set of roles is a type of scaffolding, which will assist students in understanding the work, scope of the overall project, and how each person will be held accountable in the grading rubric. "The exchange of knowledge and skills must be supported by one or more of the following measures: task specialization, support of task-specific interactions, support of group processes, and feedback or reward for the learning of the group members" (Huber & Huber, 2008, p. 113). Structure the activity by naming roles for team members to pick. This technique allows them to favor their strengths and know what to expect others to contribute. As Huber noted, though, the educator must follow through with feedback on the group product.

Ferguson (2001, p. 48) suggested important design principles for a learning environment that included the need to focus on solving real-world problems, providing learner control, and to focus on knowledge construction, not reproduction. As an educator, I struggle to turn over control of an activity to my students, especially online students whom I do not physically meet. Designing an activity that mimics a real-world problem opens the activity to creative solutions and some learner control of the product. However, the faculty member needs to be available to guide the students to a suitable solution.

The Seven-Step Checklist for Structuring Group Activities

The process of structuring the activities is more important than ever for the virtual educator. I keep a seven-step checklist handy while creating group activities so that the activity is properly structured to insure student learning.

Step 1 – Design Groups:

The size of groups is a debatable topic (Honeyfield, 1991), but I have found in my teaching that a group of three or four students is the optimal size. Another topic of research is the duration of a grouping (Hamlyn-Harris, Hurst, von Baggo, & Bayley, 2006). The length of some of my courses is only eight weeks, so I maintain the same groups throughout a semester, whether it is eight or the full sixteen weeks.

Just as in a face-to-face course, students are asked to introduce themselves to the instructor and their peers with a posting in a discussion forum entitled "Meet and Greet". The posting is required to have the perennial favorites such as name, major, hometown, classification, but I also include the requirement of a picture to be attached. The upload serves a purpose because I can then assess which students are struggling with technology at an early stage in the course.

A secondary activity is to view each others' introductions and begin a dialogue about who the students want to be grouped with. The groups are created in Blackboard and given catchy names rather than "Group #1" prior to student access. Group names can be as easy as band leaders or elements of the periodic table, to whimsical titles such as varieties of wildflowers or names of super heroes. A new feature in Blackboard "Learn" is the self-enroll function which is liberating for me as I used to read the suggested groupings in the discussion forum then create the groups manually. With the self-enroll function, the groups are formed a week sooner and without investing my valuable time. The ability to choose their group members grants the students control and thus instills a better sense of ownership in the group (Ciani, Summers, Easter, & Sheldon, 2008).

Step 2 - Provide a formative group self-assessment before the first summative assessment:

The newly-formed small group needs a period of time to get used to each other and warm-up, much like an athletic team or musical ensemble. Mandernach (2010) suggested one of the first activities for a group to engage in, as a formative assessment, is the discernment of up to six methods of communication that the group could use during the course. I adopted this technique in my course and found the usual answers of email, texting, synchronous chat, and conference call. However, technology allows for so much more with Wimba, Skype, FaceTime, GoogleDocs, Facebook messaging, and Wikis. While I dread introducing new technologies to my students, I do urge them to consider going beyond the obvious four methods of communication.

The formative nature of the early assessment is only to allow students the opportunity to work together and discover the issues that may plague them for the rest of the semester. Bart (2010) suggested that faculty provide low-stake opportunities for initial group work before gearing up to tackle larger problems. Members of small groups have independent lives with careers and responsibilities outside of the course. The dynamics of a small group need to be flexible and able to withstand the trials of power outages, computer viruses, new work schedules, medical emergencies, and the occasional vacation of a member during the course. Establishing strong communication and planning habits in small groups as the first activity is essential to the success of a group.

Early in the group communication, I enter their forum and describe how grades are calculated. This serves to motivate the group to engage in activities, but also reminds the individuals that their course grade is somewhat buffered in the rare case a group member falls silent during the semester.

I also use that opportunity to describe, as in my syllabus, the justification for doing group activities. Working in groups often increases involvement in learning because sharing one's ideas and responding to others' improves thinking and deepens understanding of the content. In today's workforce society of offices, committees, hierarchical management, and shared governance, learning to work and produce collaboratively is a highly-valued skill by employers. A survey (Casner-Lotto & Barrington, 2006) of 400 American employers identified the top five skills considered to be "very important" for university graduates as oral communications, teamwork/collaboration, work ethic, written communication, and problem solving. Four of these five skills are directly applied in well-designed online group activities.

The concept of collaboration is not new to teachers, but it may be to some of the students, so describing how to learn collaboratively is helpful. Students who have no siblings may not understand the concept of how to interact with classmates, divide and assume tasks, problem solve, constructively criticize, construct a collaborative product - a sum of the parts. For these students, I have posted remedial scaffolding throughout the activity to help guide them toward the socially accepted behavior.

Step 3 - Create an ill-structured problem for students to investigate or solve:

Jonassen (1993, p. 238) described that an ill-structured problem is relevant to the student and the course, allows students a portion of control in the task, and contains clear guidelines. All too often, I find faculty-created collaborative activities that are much more easily completed by an individual than by the group. Thus, a small group struggles to accomplish the activity and a leader emerges to complete the project for the group. If a group activity is to be successful, it should be exceptionally well constructed.

Creating the problem is challenging and a tedious process full of landmines. In a larger course online, once a problem's solution is posted, the other groups could replicate the answer unless the assigned task has multiple solutions or outcomes. Thus, student control allows groups to tailor their product, within the stated guidelines, to create a unique solution.

I build activities using a story that includes the rubric directly in the story. The motivation for the student is the fun or creativity of the story, but the rubric needs to be a part of the story so the group understands the grading expectation. I avoid specifying which technologies to use, as it limits the creativity of their product. However, some activities require a simple response method (see Figure 1). By specifying a particular technology, a student may need to purchase or learn that technology before completing the activity. In such a case, the student spends their valuable time learning a technology instead of course content. In some disciplines, the technology is critical and thus necessary to course objectives - such as statistics, engineering, or computer science.

Congratulations! Your small group attended an estate auction and placed the winning bid on a box of records from the swing era. The auctioneer has requested that you tell the audience about the contents of your amazing purchase from Old Man Keast's estate! The audience waits with baited breath for you to announce the artist and album titles.

To help you figure out the contents of your box of records, Old Man Keast left you a riddle:

In this box are 3 girls singing -	(3)
though none are white,	(1)
2 drummers and 3 trumpets swinging,	(5)
and sweet sounds of 9 band leaders right.	(9)
A score plus 3 musicians in all,	(23)
forty albums to listen to tonight.	(40)
Grab the box and take it to the nearest dancing hall!	(81 total points)

Solve the riddle and tell us the artist name and album title for the contents in your box. (Hint: there are tons of solutions - it would be erroneous to think I have a "correct" answer in mind.)

After creating the document inside of GoogleDocs, post the finalized document in the ***"Auction Box Contents"*** discussion forum for grading and peer comments.

Figure 2: Jazz History course, Swing activity for small groups

Step 4 - State learning objectives suggesting the student groups' final products:

Planning and development of any instruction should rest on the careful definition of the course goals. What is it that I want the students to be able to do at the end of the course? In addition to course-level goals, learning objectives are created for each module or unit of the course. A learning objective generally adheres to the categories first described by Bloom (1956): knowledge, comprehension, application, analysis, synthesis, and evaluation. Several locations on the Internet are available for selecting verbs to start the learning objective. A Google search will locate many helpful websites.

The learning objective communicates the actions, performance criteria, and conditions of what students will be able to do upon completing a module or unit in the course. Students should be able to discern what the final product will look or sound like in order to begin an activity. I refrain from providing examples to students as the example tends to be treated as a model and thus replicated in some fashion. I am more interested in the creativity of each group's solution or product than I am in the homogenous nature of the class' products.

Course goals and learning objectives must be *measurable and observable.* When reviewing courses for my peers, I find course-level goals stating: “Increase student awareness of…” Such a goal is not easily measurable or observed. Transform the goal, specifying a student product or action that is observable and measurable and, thus, a much stronger goal for assessment.

In my reviews of others’ courses, I also find learning objectives that are not readily available to the students, but tucked away for instructor reference. The learning objectives are for both faculty and students. Faculty need the statements to ensure the lesson is structured and focused, while students need the learning objective to make certain they have gleaned all the skills necessary for successful course completion. I place the learning objectives first in my online courses, just as face-to-face teachers place the objectives on the blackboard at the start of a lesson.

Step 5 - Set a timeline and sequence of steps toward achieving the objectives to illustrate the value of the process:

Online courses vary in length and a timeline is important in order for students to plan accordingly. In my eight-week course, I present the term paper in the third week and start a process of topic selection and thesis writing so as to avoid the last-minute panic (see Figure 2). A subsequent week requests students to email a rough draft to the campus writing center for help with content, clarity, and grammar. The process of the term paper is graded, as well as the final product. The rigid process can be cumbersome, but has resulted in better student research practices.

A course in music can be very boring unless you, the student, has some input into what you study. This is that opportunity! The purpose of writing a term paper is to convince the reader of your unique prospective on a subject. I am anxious to see your inspired research!

It is 10% of your final grade, so please take it seriously.

Over the next few weeks you will be assigned tasks that will lead to the completion of your term paper. There are due dates for each task. Completing each task by its due date is vital in order for you to complete the term paper by the final due date so do not get behind.

You will be graded according to the following rubric (click to view):

Term Paper Rubric

Let's get started with the first task:

Investigate a topic about the history of American music education that was addressed in the course, but perhaps not as deeply as you desired. Think of a topic that we might have touched on a bit, not enough, a lot, whatever, and research it further.

Keep the topic narrow enough that you can accomplish something in a short 5 - 8 page Term Paper. A paper about American Music History between 1850 and 1900 may seem narrow, but there are many things to cover in such a paper. A good topic may have a fairly long title – my dissertation was a 200 page book about a very small topic. I had plenty to talk about in the book.

Figure 3: History of American Music Education, Term paper presentation - week #3

A challenge that even I struggle to overcome is illustrating the process of the group collaboration into the overall grade for the assignment. Mandernach (2010) discussed how she included a process component in each group project grade. One way she evidenced the process grade is her “Divide – Conquer – Converge” method for online teaching. The small groups are asked to email each other ideas about how to divide the assigned task, complete their components of the assigned task, then converge to share and finish the activity for a grade. The process is evidenced in the division of the work and convergence where the final product is constructed.

The intensity of a short eight-week course is troublesome for a social constructivist educator such as myself. Most small groups spend a couple weeks getting to know one another before the best work emerges. I often find the best small group projects are toward the end of the group’s work, not at the beginning of the course. When constructing an activity, I attempt to increase the complexity of projects as the course progresses. The group members are able to meet the higher expectations because of the solid foundation created by previous weeks’ work together.

Step 6 - Create motivation for students:

One way to motivate students is to honor their learning style: visual, kinesthetic, or auditory. In one activity, I use or suggest projects that use diagrams, videos, or provide links to performers' websites to engage the visual learner. Another unit involves audio files for lectures and music examples or grading discussion threads inside the Learning Management System forums for the auditory learners. In another unit, to help the kinesthetic learners, I ask them to engage in physical experiments to measure the length of time the learner can hold a stream of air steady. They can then understand how challenging it can be to perform extended phrases.

I refrain from offering extra credit in my online courses as the majority of the students who would complete the activities do not need the extra points. Instead, I am a cheerleader for my students' work – citing the first to post their product, most innovative approach to the solution, most comical response, and the typical class favorite - the most commented-on thread of a unit's discussion.

Another place to use the cheerleader technique is in regular class-wide communication such as a weekly email or daily blog entry. When I highlight a particularly successful project from the last unit, two things happen: others go back to view the project to see what I consider "good," and the creators of that project are given a cyber-pat on the back for a job well done. I think of it as the online educator's version of adjacent peer reinforcement.

I also send each group an email after the first couple activities are completed, asking for an individual reply to tell me how things are going for that group. In my email, I suggest they reflect upon who is contributing and present in the discussions, who appears to be the leader of the group, who is best with technology, what struggles the group has facing them, and to identify how they have contributed to the recent projects. I title the email "pulse check" and actually intend for it to be my tool to root out any individuals not contributing. However, students often start their reply by thanking me for asking them about the course and how to help them. I believe the "pulse check" is a motivating communication.

Step 7 - Suggest the various roles for each member of a group:

Small groups in online courses can be stressful for students. Some students have a natural affinity for small group work while others bristle at the thought of turning over control of part of their grade to a peer. An activity must include natural barriers so students can begin their process of dividing up the activity into manageable portions, which helps to alleviate overwhelming stress felt by some students.

In the Auction Box Contents activity (Figure 1), the riddle’s first two lines could be one group member’s task while lines three and four are completed by two other members. The fifth and sixth lines are best accomplished after synthesizing the material of the three group members and adding remaining musicians/bands (while carefully avoiding band leaders, drummers, trumpets, or female singers).

The "Divide – Conquer – Converge" technique described by Mandernach (2010) works to evenly distribute work and to converge in order to construct the final product. Group members who are late to the convergence--or absent altogether--create tension for the others. In such cases, I remind students about peer evaluation and my ability to view the work contributions using GoogleDocs.

Group accountability can be measured by the attainment of the stated learning objectives and by using a rubric for grading that is shared with the students during statement of the problem (see step #3). Roles can be assigned by lines of the riddle (Figure 1) or generic title assignments such as leader (facilitates discussions), initiator (brainstorms new ideas), recorder (records ideas), skeptic (cites potential flaws in ideas), optimist (mains positivity in the group), timekeeper (helps set goals for stages of the process), gate keeper (ensures that each member participates), and summarizer (synthesizes, collects, and reports options).

Using the Checklist

A group learning project must be well-structured if it is to be successful. The checklist helps to insure my collaborative learning projects are as successful as possible each semester.

1. Design group size and duration; divide up students into groups.
2. Provide a formative group self-assessment before the first summative assessment.
3. Create an ill-structured problem for students to investigate or solve.
4. State learning objectives suggesting the student groups' final products.
5. Set a timeline and sequence of steps toward achieving the objectives to illustrate the value of the process.
6. Create motivation for students.
7. Suggest the various roles for each member of a group (i.e. recorder, summarizer, devil's advocate, technology wizard, resource finder, etc.).

The use of this list has allowed me to reduce the social loafers and sucker effect by instilling a sense of teamwork. The rubrics illustrate my value of each member's role in the final product. Thus, interdependence is built into the activity. By constructing the activities using a real world activity, the immediate application is obvious and motivating for the students.

The scenario described at the beginning of this paper illustrates a master teacher's planning of a problem for her class. She allowed the class to form groups and then assigned roles for each member of the group (step #1 and #7). An ill-structured problem was given to the students along with a clear objective that suggested a format for the groups' product (steps #3 and #4). A worksheet was given to help the group collect information needed in order to complete the task successfully (step #2). The timeline given to the students was to create the product during the class session (step #5). As the students worked together, she was able to monitor activity and provide the motivation by praising exemplary work while also redirecting other groups who meandered off task (step #6).

With the use of this checklist, a course instructor properly plans the activities and the likelihood of adequate scaffolding placed throughout the course. When students need help in the online course - and the faculty member is not available - who is going to help the student? A well-developed course contains scaffolding to assist the students with tasks. Use of this checklist, in addition to scaffolding, will enable students to succeed in accomplishing the stated learning objectives and course goals while also honing cooperative skills necessary in the workplace.

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