# Assessing Activity-Based Learning in Criminal Law: A New Model and Novel Game Based on Metacognitive Theory

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## Abstract

The effectiveness of the differences in instructional methods in the classroom have clearly been correlated to the learner's experience over the last thirty years; however, there remain significant questions as to student- perceived value as well as learning effectiveness. In this study a novel activity-based learning game was designed from metacognitive principles and an original model: the construction-deconstruction connectionist (CDC) model. The model was developed from the premise that for purposes of classroom learning, learning is not only a cognitive event but also a psycho-dynamic, social process. Two assessments were developed for purposes of the study: one to measure the learner experience and one to measure applied learning and knowledge gains from the activity. Overall results indicated both perceived value and learning effectiveness.

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***Introduction***

For the last thirty years, the discussion has continued as to how specific teaching strategies and types of instruction impact a student's academic experience. Although many scholars have examined multiple variables and the relationship of the variables to the learner's experience there remain significant questions as to perceived learner value and knowledge gain The purpose of this paper is to focus attention on a novel model of activity-based learning that can promote deeper learning, understanding of instructional content, knowledge gains, and perceived learner effectiveness. A new game, "Name that Crime," was tested in an upper-level, undergraduate criminal law class to determine its perceived value in acquiring important skills sets, as measured by two assessments. The expectation is that the model can be further tested across various academic courses and disciplines.

***Literature Review***

Since the mid 1990s traditional passive, behavioral approaches to teaching and learning such as learning that is instructor-centered, not inquiry-based, participatory, nor collaborative, have succumbed to more constructivist approaches where learners are active participants in the learning experience (Bransford, Brown, & Cocking, 1999; Salas & Cannon-Bowers, 2001; Mayer, 2004). Researchers (i.e., Dean, 2006; Douglas, Burton & Reese-Durham, 2008) have found that this type of passive information-dissemination direct instruction, when compared to more robust methods of instruction, have fallen significantly short in developing strong cognitive and metacognitive abilities or academic skills. Active, constructivist learning, on the other hand, emphasizes an inductive methodology where there is experimentation (Smith, 1997) and knowledge construction (Wells, 1985).

The active, constructivist theory is based on the view that students are active processors of content in control of their own learning (Winne & Hadwin, 1998), and are active agents assuming responsibility and management in their own learning process. Research has demonstrated that active learning promotes the development of self-regulation and self-facilitation skills (Ivancic & Hesketh, 2000), which are the main components of metacognition (Flavell, 1979; Brown, 1987). In addition, the development of metacognitive ability has been correlated in many studies to academic achievement (Meece, Blumenfeld, & Hoyle, 1988; Pang, 2008). For example, Stewart, Cooper, and Moulding (2007) found that students with developed metacognitive skills achieved greater academic success than students with less developed skills. Since the primary components of metacognition require self-regulation, planning, and monitoring in order to develop these skills, learners need a learning environment that facilitates self-directed and active learning (Holyoak, 1991; Sweller, Mawer, & Ward, 1983). This type of learning is an inductive process, where learning is developed through exploration and experimentation that stimulates the development of metacognitive ability (Ford & Kraiger, 1995) as contrasted with a more deductive method where exploration is constrained by a passive pedagogy (Keith & Frese, 2005). Further, active learning requires skills of adaptive transfer where learners can create new scenarios and solutions to demonstrate understanding and then evaluate perceived learning effectiveness (Ivancic & Hesketh, 2000).

Contemporary views of learning suggest that the knowledge-construction process is based on experiences and beliefs, a derived epistemology that scaffolds based on the continual interaction between the learner and the experience (Bransford et al. 2000). In this context, active learning requires not only metacognitive development but an understanding of one's self in the learning process. In designing learning based on an active, constructivist approach, educators

elevate levels of understanding, generate self-confidence and motivation, among other psychological constructs (Pang, 2008), and promote deeper learning. For example, Reeves and Francis (2002) in a study emphasizing problem-based learning found that pharmacy students were more inquisitive in the learning process, which impacted retention of the content and its application to new scenarios. Gonzalez del Rey and Baker (2001) developed a novel instructional method they named "microburst learning" that combined role-plays, experiential activities, group discussions, and simulations that were presented as "short bursts" and found correlations to more effective learning that included increased attention and motivation.

The connection between an active, constructivist-oriented instructional strategy that engages metacognitive skills activities with various components that are essential for success, such as motivation and personal epistemology, is more meaningful for learner development. Studies continue to reveal that students with well-developed constructivist-oriented, epistemological beliefs demonstrate more advanced and deeper higher-level thinking (Fink, 2003) and decision-making (Tu, Shih, & Tsai, 2007). It is, therefore, apparent that transforming instructional pedagogy to foster active learning is necessary for more effective and meaningful learning. In order to assist in this change, this paper presents a model for an active, learning-based activity and an assessment that fosters active learning based on an understanding that students are more engaged when they become involved with their learning (Gaffam, 2007). This model has been designed to shift the responsibility for learning to the learner in the acquisition and application of domain-specific content while building the metacognitive skills necessary for academic success and a meaningful learning experience (Brown & Campione 1994). As a result, the hypothesis is that pedagogy derived from instructional strategies that facilitate metacognitive

ability utilizing active and activity-based learning not only improves performance, as measured by knowledge gains, but enhances the overall educational experience.

***The Construction-Deconstruction Connectionist Model***

The construction-deconstruction connectionist (CDC) model is a new approach based on a collaborative, active learning in-class activity, "Name that Crime." The CDC model is built upon the premise that for purposes of classroom learning, instruction is not only a cognitive event but a psycho-dynamic, social process that needs to consider the four metacognitive domains that manifest in an academic environment. These domains include: (a) the student (metacognition of self); (b) the classroom (metacognition of learning environment); (c) the professor (metacognition of professor); and (d) other students (metacognition of classmates) (Pang, 2008). In the CDC model, both the construction and deconstruction processes operate in a connectionist manner. Central to this model is the premise that learning must be chunked and connected. Chunking is a concept that is familiar in literature on the development of expertise and is used to explain the development of mental representations (Egan and Schwartz (1979). For purposes of this model, the main points or principles of the theory, or the main elements of a statute, are chunked by learners to facilitate learning through association, connections, and representations. This process of chunking and connecting content allows the application of the content with greater facility, speed, and ease in the deconstruction and connectionist steps in the model. In essence, in the CDC model it is an efficient way of organizing information for later retrieval, a form of parsing.

From an instructional strategy perspective, the learner must be encouraged to develop relevance through connection and demonstrate scaffolding through knowledge construction and deconstruction. For purposes of this research, learning is refers to the acquisition of knowledge

and the development of understanding. It is the activation of chunked components of content that are represented in the construction and deconstruction process. This is a form of progressive scaffolding that is continually upgrading previously established associations of content knowledge (McAlpine, 2004). In such, the construction-deconstruction connectionist process model that was developed for purposes of this research has four scaffolding steps.

*The First Step*

The first step is the process of construction. Simply stated, construction is the development or building of an original hypothetical fact pattern without guidance, input, or direction from the instructor. Construction involves the learner in developing a context that adequately explains or illustrates a principle from original individual or collaborative thought. In order to successfully engage in construction one must understand the component constructs of the principle in sufficient detail so as to construct a contextual environment for its representation. This step is similar to a construction process advocated by Kintsch (1998) in research on comprehension, where he suggested that readers construct a textbase that contains the propositional meaning of the text from the textual input. In accord with Kintsch, in our step of construction there is an activatation of relevant components from the applicable principles that are used to construct a coherent representation organized as a hypothetical fact pattern.

This step of construction further aligns with the precepts of schema theory that suggests that there must be congruency between the interpretation or understanding of new knowledge and integration with activated schemata (Anderson, 1984). Sadoski, Paivio, and Goetz (1991) argued that “schemata are, by most accounts, abstractions derived from experience, that exist in a potential, nonspecific state, awaiting input” so these notions cannot exist “isolated from any of the examples that gave rise to it” (p. 467). Therefore, the construction step provides the means by

which the learner transforms knowledge components that are disconnected or nonspecific from abstractions to tangible propositions that have meaning within the constructed illustrative environment.

*The Second Step*

The second step requires deconstruction. Deconstruction requires the extraction and identification of the main or material components or concepts embedded in the hypothetical fact pattern In other words, deconstruction is the disassembly of the main concepts that demonstrate that the learner understands the components of the assigned principle. Students in this step use a heuristic that is analogous to reverse engineering or deconstruction in architectural-driven learning activities (Colajanni, Concialdi, & Pellitteri, 2001) or component architecture in web-based environments (Stearns, Gargus, Schuetze, & Lombardi 2006).

*The Third Step*

The third step highlights understanding through connection. According to Kintsch (1998), for purposes of illustrating comprehension, there is a mapping process between the new knowledge and preexisting knowledge structures. This mapping is illuminated in the third step of the model, which is the concept of connection. In this step the learner connects the assigned principle to the words or sentences in the hypothetical fact pattern that are illustrative of the theory demonstrating an ability to perform illustrative connections. The ability to connect chunked components of a theory to illustrative exemplars of the theory develops a type of coherence from which one can draw inferences to illustrate understanding in the fourth step.

*The Fourth Step*

The purpose of the fourth step is to provide an opportunity for the learner and the professor to glean insights on the illustrative connection process through the demonstration of

more expert understanding by the student. In providing commentary or explanatory text as annotations to the illustrative connections in the third step, they reveal their reasoning processes. Inherent in the constructivist, active learning paradigm is the belief that learners who develop active learning skills tend to seek meaning and understanding and are more adept at integrating new knowledge with existing knowledge as demonstrated in the third step (Law, Chan, & Sachs, 2008). Developing commentary provides further insights into understanding and research has shown that students who use constructivist, active strategies are more engaged in the learning process (Ainley, 1995).

**Research Purposes**

The purpose of this paper was therefore three-fold. First, to develop a novel learning activity based on a novel model for developing and applying understanding of domain content across academic disciplines. Second, to test the model as an instrument for active learning, by administering it in a criminal law class to assess perceived learner value. Third, to determine any correlations between the perceived value of the activities and the assessed understanding of the domain specific content.

**Methods**

*Participants*

Participants were 31 undergraduate junior or senior students who were enrolled in a criminal law course as part of a requirement for a criminal justice major. The participants were students from a 6,000-student public university in rural Texas. Of the participants, 54% were female, 70% were Caucasian, and 84% were between the ages of 18 and 30. These students were representative of the typical junior and senior at the university.

*Intervention: Construction-Deconstruction Connectionist In-class Activity for Active Learning*

*Pre-Activity*

Prior to the administration of the activity, the instructor identified a principle, which had been assigned previously and discussed in class. For purposes of this research, the criminal law students were assigned reading on the different types of homicide and in-class discussion was conducted on the elements of the different types of homicide as presented in the Texas Penal Code.

*Class 1*

For purposes of the first step, students were asked to form groups of 3-6 (depending on class size and the number of types of homicide) so that each group had a different type of homicide (i.e., capital murder, voluntary manslaughter). The instructor distributed a piece of paper with the name of a type of homicide to each group and asked them to develop a hypothetical fact-pattern  without using any of the specific words that were elements of the particular type of homicide. For example, participants were instructed not to use words such as Joe intended to kill John, because it would use the word 'intent,' which is an element of the crime of intent-to-kill murder, a type of homicide. Instead, they were instructed to use descriptive terms, such as Joe and John were arguing when Joe decided he really hated John and was going to kill him the next time they were together. This sentence would be illustrative of the mental state of intent without using the word intent. Students were then asked to turn in one paper for the entire group with the names of all group members at the end of the class (or allocated time period). Students were reminded that they only had the class period so they needed to use their time wisely. As an aside, from an instructor perspective, it was interesting to

observe how the groups functioned, how they assigned responsibilities, who were responsible for writing the assignment, and if they referred to textbooks or course materials. These observations are not within the realm of this research but can provide useful insight for an instructor for future collaborative assignments and teamwork.

*Class 2*

The next class period was used to continue playing the activity game. The instructor started the class by announcing, "we will now play 'name that crime.'" The students were asked to assemble into the same groups and take out a piece of paper. The instructor read the first hypothetical fact pattern without telling them the applicable theory and then allocated 30 seconds to 1-minute for each group to discuss among themselves and write down the name of the crime. This was continued until all of the hypothetical fact patterns that were submitted were read aloud by the instructor. The instructor then went back to the first hypothetical fact pattern and asked the students to name that crime by allowing them to shout it out, even simultaneously, and then wrote the answers on the whiteboard (or blackboard) and announced the correct crime. Students were then instructed to place a check or an "x" on their paper indicating which ones they identified correctly and incorrectly, to write all members of the group's names on the paper, and turn it into the instructor. If there is remaining time an instructor can discuss more about the crimes, theories, etc. and the student can construct another hypothetical as it related to the activity.

*Pre-Class 3/Class 3*

Within the next few weeks a class period was chosen for the next steps, 2-4. During the designated class, the instructor brought the original papers with the hypothetical fact pattern to class and asked the students to arrange themselves in the same groups. The instructor then

distributed the group's original paper back to each group as well as a paper from another group with the name of the crime on top and the group members' names removed or blacked-out. The groups were then provided with these instructions:

1. Using a highlighter, pen, etc. circle, underline, highlight those words or sentences that illustrate the main or material components of the crime.
2. Connect the words or sentences in the hypothetical fact pattern to the main or material components of the assigned crime by writing it in the margin, inserting a footnote number, and then writing it on another page.
3. Write sufficient commentary or explanatory text as an annotation to the highlighted, underlined or circled part of the text to show how those words or sentences demonstrate the main or material components of the assigned crime.
4. Manage the allocated time.

For example, in criminal law the elements of the crime of manslaughter are "a person commits an offense if he recklessly causes the death of an individual." Students will know that the mental state of 'reckless' is what will be difficult to identify so they will need to find the words or sentences that illustrate 'recklessness'. Students will know that under the Texas Penal Code:

> 'reckless' is defined as "a person acts recklessly, or is reckless, with respect to circumstances surrounding his conduct or the result of his conduct when he is aware of but consciously disregards a substantial and unjustifiable risk that the circumstances exist or the result will occur. The risk must be of such a nature and degree that its disregard constitutes a gross deviation from the standard of care that an ordinary person would exercise under all the circumstances as viewed from the actor's standpoint."

In making the connection they would note the underlined, highlighted, or circled words and use a footnote, write in the margin, etc. to explain that the circled words, sentence (etc.) showed recklessness. In their explanatory commentary they would explain what the sentences illustrated

about the elements of the crime based on the hypothetical fact pattern. For example, they would explain that:

1. Joe knew that John always walked his dog in the morning on a crowded sidewalk
2. When Joe chose to jump the curb with his skateboard it would be inevitable that he would knock someone down.
3. In this case an 85-year old woman who, when she fell down, cracked her head on the sidewalk and died

They would explain that these actions were illustrative of the mental state of recklessness because of the conscious disregard and substantial and unjustifiable risk that the circumstances as they existed would result in the possible death of the 85-year old woman.

*Grading and Assessment*

The instructor then used the grading rubric (see Appendix A) for the purpose of assessing academic performance of the in-class activity. At the start of the next class session, the instructor allocated 5-10 minutes at the start of class to administer the self-assessment. (see Appendix B). The self-reporting instrument was composed of 10 questions on a 5-point Likert scale, ranging from 1 (lowest) to 5 (highest). The self-report assessment measured the students' attitudinal responses to the in-class activity and its perceived value to the student. The self-assessment was intended as a subjective measure of perceived value of the in-class activities and perceived knowledge gains. The data from the self-assessment provides insights to the instructor as to the perceived value of the in-class activities and its perceived value for learning effectiveness.

***Materials and Procedure***

The intervention was administered in three separate 50-minute classes in the Criminal Law course. In the first 50-minute class session, learners were assigned to groups of 3-6 students.

They were assigned a crime and were instructed to *construct* a hypothetical fact pattern to turn in at the end of class. In the next 50-minute class session, they were asked to sit in the same groups from the last class and were asked to write down the name of the crime as the instructor read the assignments aloud to the entire class and then score their answers. Two weeks later, the assignments were returned to the original groups, and they were provided a copy of one other group's assignment and were asked to *deconstruct* the hypothetical fact pattern, *connect* the circled or underlined words or sentences in the hypothetical fact pattern to the elements of the crime, and then provide *commentary or explanatory text* as annotations to the illustrative connections so as to provide insight into their reasoning process and demonstrate their understanding of the course content.

*Results*

The 7 groups were each comprised of 4-5 students who were randomly assigned to work together on the in-class activity. Each group was assigned a crime (i.e., voluntary manslaughter, negligent homicide) and was asked to construct a fact pattern based on the elements of the crime. Students were allowed to consult the Texas Penal Code, Model Penal Code, and/or their textbooks and notes. Based on the grading rubric (see Appendix A), each group received a grade of *A* that was transposed as a 4.0 for purposes of analyzing the results. The same groups were then asked to perform the deconstruction, connectionist, and demonstration of understanding activities. Six of the seven groups received an *A* or 4.0 with one group receiving an *F* or 0 on the deconstruction activity with M = 3.43 or a *B*+ on the deconstruction activity. On the connectionist activity three groups received an *A* or 4.0, three groups received a *C* or 2.0 and one group received a *B* or 3.0 with M = 3.0 or *B*. On the demonstration of understanding, the fourth

and final step of the activity, five groups received an *A* or 4.0 and 2 groups received a *C* or 2.0 with an M = 3.43 or a *B*+.

The 31 students also completed a self-assessment of the perceived value of the in-class activity and learning experience. The results indicated that Questions 2, 3, 4, 5, 6, 7, and 9 had M > 4.0. Questions 1, 8, and 10 had M < 4.0 but greater than 3.5. Question 6 had the high score of 4.61 and question 10 had a low score of 3.77. No question had a score below 3.5 where the mean for all of the questions was 4.17.

Table 1

*Self-Assessment: Learner Perceived Value*

| **Questions** | **M** | **SD** |
|---|---|---|
| 1. I found that working in a group on an in-class activity was helpful for more learning. | 3.87 | .144 |
| 2. I found that I learned more about a theory in developing an illustration, scenario, hypothetical to explain it. | 4.38 | .088 |
| 3. I found it helpful to my understanding of the theory to have to take apart the illustration, scenario, or hypothetical and identify the main points of the theory. | 4.25 | .122 |
| 4. I enjoyed playing "name that crime" in class. | 4.00 | .131 |
| 5. I think playing games such as "name that theory" helps me to learn more about the theory. | 4.38 | .128 |
| 6. I think it is important to be challenged academically. | 4.61 | .088 |
| 7. I think having to provide explanations of how the parts or points of the theory were illustrated in the scenario or hypothetical helped me to understand more about the theory. | 4.43 | .130 |
| 8. I think in-class activities are a better way to learn than lectures. | 3.93 | .185 |
| 9. I think I learn more when I have to be active in my learning by participating in activities rather than receiving information, for example, in a lecture. | 4.03 | .204 |
| 10. I prefer work in groups in class and apply the course material in an in-class activity then listen to a lecture. | 3.77 | .200 |

Note. The self-assessment ranged from 1 ("strongly disagree") to 5 ("strongly agree").

## *Discussion*

### *Key Findings and Implications for the Model*

The findings indicate that the students were able to transfer the knowledge of the elements of the crime to develop an original fact pattern and demonstrate success in the construction step of the activity. The findings also reveal that the majority of students were able to reverse the process and deconstruct the fact pattern by highlighting the sentences or words that supported the elements of the crime. The one group that failed the deconstruction step of the assignment may have failed to understand the instructions or failed to seek clarification. It would be interesting to test the model and the activity again with a measure to ensure student understanding of the instructions for all steps of the activity. The results from the third step illustrate more of a bell curve with a fairly disbursed grade representation with a low of C and a high of A. The mean of 3.0 demonstrates that most students understand how to connect the sentences and words from the fact pattern with elements of the crime and describe the relevancy of the connection; however, this is an area where there is room for improvement. It would appear that students need more in-class, activity-based work on establishing, developing, and defining connections, which is a critical part of developing well-reasoned analysis and critical thinking skills. Finally, in the demonstration of understanding part of the activity, although the mean was a B+, the results also reveal that while five of the seven groups received an A, two of the groups needed to develop improved analytical reasoning skills.

The findings indicate that students, when challenged with a new way of approaching course material and are offered the opportunity to collaborate and draw from each others' strengths, can apply cognate principles in both the construction and deconstruction of examples (i.e., fact patterns) that illustrate their understanding of the core principles. Where there is need

for continued opportunities for in-class activities to develop learning skills is in the analytical reasoning and critical thinking that demonstrates understanding of course concepts in more detail and in-depth environments. The findings on the self-assessment indicate that overall the students found the in-class activity to be helpful for learning and that the highest score revealed that students find it important to be challenged academically. It is also interesting to note the difference between question 9 and 10, which indicates that students may enjoy participating in activities rather than listening to lectures, but to evaluate these responses in more detail it would be necessary to eliminate the word 'group' from question 10 in future research. A few students submitted comments on the self-assessment indicating that they were introverts and preferred individual to group activities. Further research using the CDC model on individual versus group activities would be interesting to further determine the perceived value of activities based on the CDC model.

While the findings provide some insights into the usefulness of the CDC model for knowledge gains and perceived learner value, there is opportunity for further research. For example, it would be interesting to explore how the CDC model can be applied in other content domains. It would also be valuable to test the model using a larger sample size in a mix of lower-division and upper-division courses across academic domains. Another opportunity for future research is to conduct empirical research that correlates findings of knowledge gains and perceived learner value in traditional, passive lecture courses and courses engaging a more active, constructivist learning method; perhaps integrating the CDC model in those courses. In addition, developing activities that are derived from a construction-deconstruction-connectionist paradigm would prove useful for further developing and testing the CDC model as an instruction strategy for learner success.

*Limitations*

Limitations in the current research pertain to the testing of the model in one course with one professor. A wider distribution of courses with different professors would provide further insights into the applicability of the CDC model in higher education. Another limitation is the sample size which is small and therefore, the model should be tested with larger samples in additional courses. As a result, of the small sample size it may be difficult to generalize the results and have professors draw conclusions about the usefulness of this model in their cognate subjects.

**Conclusion**

The results indicated that the CDC model and the in-class activity based on the model had both academic value, as measured by knowledge gains and perceived learner value. In addition, learners demonstrated a deeper understanding of the course material in the deconstruction and connection aspects of the activity by critically thinking about application of the course content. The findings also suggest that there was high learner satisfaction with the opportunity to be actively engaged in a learning activity, collaborate with classmates, and work on an activity rather than listen to a lecture. The responses: "I found that I learned more about a theory in developing an illustration, scenario, hypothetical to explain it ( M = 4.38); (b) I think playing games such as "name that theory" helps me to learn more about the Theory (M = 4.3*); and (c) I think having to provide explanations of how the parts or points of the theory were illustrated in the scenario or hypothetical helped me to understand more about the theory (M = 4.43) all demonstrate that there is a perceived connection between the learning in the CDC model and the value of the activity to the students' learning. Based on responses,

students enjoyed playing 'name that crime' and found it helpful to their learning to engage in the steps of construction (Question 2) and deconstruction (Question 3).

As Douglas, Burton, and Reese-Durham (2008) suggested it appears that the CDC model based activity provides a more robust method of instruction that develops cognitive skills. Further, the findings also suggest that the CDC model activities promote active learning where according to Ivancic & Hesketh (2000) students are able to create solutions that demonstrate content understanding as well as perceive learning effectiveness. In such, it would appear that the CDC model has application to multiple content domains and can be used by professors across academic disciplines as an alternate to more passive instructional pedagogies, such as lectures and PowerPoint presentations. For example, a professor in a literature course could structure an activity based on the CDC model that required students to deconstruct a literature passage based on a particular theme and then connect it to the components of the theme. The same type of application could be used in a political science course where students might examine a political theory in light of Constitutional precepts and use the steps in the CDC model to answer questions in a collaborative, group activity classroom setting. Since it appears that working on activities in class has not only academic value but perceived value, which is an important part of creating academic value for the student, further research in other content areas would be valuable in further assessing the CDC model as an effective instructional and learning pedagogy.

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# APPENDIX A

## Grading Rubric

Group: _____

Students Names:

Construction Step: _____

Assign a letter grade from A-F based on how well the group's hypothetical, illustration, or scenario illustrated the theory.

Deconstruction Step: _____

Assign a letter grade from A-F based on how well the group highlighted, underlined, or circled those words or sentences that illustrated the main or material components of the assigned concept, theory, or principle.

Connectionist Step: _____

Assign a letter grade from A-F based on how well the group connected the words or sentences in the fact pattern, hypothetical, or illustration to the main or material components of the assigned concept, theory, or principle.

Demonstration of Understanding: _____

Assign a letter grade from A-F based on how well the group provided commentary or explanatory text as annotations to the highlighted, underlined, or circled part of the text to show how those words or sentences demonstrate the main or material components of the assigned concept, theory, or principle.

The grading for the construction step was based on how well the group's hypothetical, illustration, or scenario illustrated the theory. An "A" indicated that the theory was immediately recognizable to the reader. A "B" indicated that there were portions of the theory apparent in the hypothetical, illustration, or scenario but the theory was neither immediately recognizable nor complete. A "C" indicated that there was some understanding of the theory but the hypothetical, illustration, or scenario did not adequately illustrate the theory. A "D" indicated that the theory was only minimally apparent and the hypothetical, illustration, or scenario did not represent the theory. An "F" indicated that neither the theory, nor the hypothetical, illustration, or scenario was apparent or correct.

The grading for the deconstruction step was based on how well the group highlighted, underlined, or circled those words or sentences that illustrated the main or material components

of the assigned concept, theory, or principle. An "A" indicated that more than 90% of the main or material components of the concept, theory, or principle were appropriately identified. A "B" indicated that more than 80% of the main or material components of the concept, theory, or principle were appropriately identified. A "C" indicated that more than 70% of the main or material components of the concept, theory, or principle were appropriately identified. A "D" indicated that more than 60% of the main or material components of the concept, theory, or principle were appropriately identified. An "F" indicated that less than 59% of the main or material components of the concept, theory or principle were appropriately identified.

The grading for the connectionist step was based on how well the group connected the words or sentences in the fact pattern, hypothetical, or illustration to the main or material components of the assigned concept, theory, or principle. An "A" indicated that more than 90% of the main or material components of the concept, theory or principle were connected to the words or sentences in the fact pattern, hypothetical, or illustration. A "B" indicated that more than 80% of the main or material components of the concept, theory, or principle were words or sentences in the fact pattern, hypothetical, or illustration. A "C" indicated that more than 70% of the main or material components of the concept, theory, or principle were words or sentences in the fact pattern, hypothetical, or illustration. A "D" indicated that more than 60% of the main or material components of the concept, theory, or principle were words or sentences in the fact pattern, hypothetical, or illustration. An "F" indicated that less than 59% of the main or material components of the concept, theory, or principle were words or sentences in the fact pattern, hypothetical, or illustration.

The grading for the demonstration of understanding was based on how well the group provided commentary or explanatory text as annotations to the highlighted, underlined, or circled part of the text to show how those words or sentences demonstrated the main or material components of the assigned concept, theory, or principle. An "A" indicated that more than 90% of the commentary or explanatory text showed how the words or sentences demonstrated the main or material components of the assigned concept, theory, or principle. A "B" indicated that more than 80% of the commentary or explanatory text showed how the words or sentences demonstrated the main or material components of the assigned concept, theory, or principle. A "C" indicated that more than 70% of the commentary or explanatory text showed how the words or sentences demonstrated the main or material components of the assigned concept, theory, or principle. A "D" indicated that more than 60% of the commentary or explanatory text showed how the words or sentences demonstrated the main or material components of the assigned concept, theory, or principle. A "F" indicated that less than 59% of the commentary or explanatory text showed how the words or sentences demonstrated the main or material components of the assigned concept, theory, or principle.

**Appendix B**

**CDC Assessment**

Name: _____ Gender: ___ Male ____ Female
Course Name: _____ Professor: _____

**Please answer each question in terms of how "helpful" the item(s) in the question are to your success in this course:**

| Question | 1. Strongly Disagree | 2. Disagree | 3. Undecided | 4. Agree | 5. Strongly Agree |
|---|---|---|---|---|---|
| 1. I found that working in a group on an in-class activity was helpful for more learning. | | | | | |
| 2. I found that I learned more about a theory in developing an illustration, scenario, or hypothetical to explain it. | | | | | |
| 3. I found it helpful to my understanding of the theory to have to take apart the illustration, scenario, or hypothetical and identify the main points of the theory. | | | | | |
| 4. I enjoyed playing "name that theory" in class. | | | | | |
| 5. I think playing games such as "name that theory" helps me to learn more about the theory. | | | | | |
| 6. I think it is important to be challenged academically. | | | | | |
| 7. I think having to provide explanations of how the parts or points of the theory were illustrated in the scenario or hypothetical helped me to understand more about the theory. | | | | | |
| 8. I think in-class activities are a better way to learn than lectures. | | | | | |
| 9. I think I learn more when I have to be active in my learning by participating in activities rather than receiving information, for example, in a lecture. | | | | | |
| 10. I prefer work in groups in class and apply the course material in an in-class activity than listen to a lecture. | | | | | |