## **Competency Performance Recording for Learning (CPR-L)**

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CPR-L is a teaching and learning methodology enabled by authenticated, broadly accepted learning protocols and 21<sup>st</sup> century technologies. It is aimed at "resuscitating" student's learning of the analytical process of problem solving, thus enhancing their problem solving skills as well as their understanding of core course concepts. Although it utilizes modern technologies to involve larger groups of students more rapidly than could be possible without technological support, the processes it adheres to have been effective for learning throughout the ages.

Tasks and exercises aimed at impact retention of information, understanding of course concepts, maintaining the integrity of the problem-solving process and exorcising bad learning habits were incorporated into the teaching and learning process. These exercises include: 1) Thoroughly understanding the problem before proceeding to solve it. 2) Following problem solving process and protocols. 3) Writing something down to aid in conceptualizing- sketching the concept of problems. 4) Speaking aloud when possible to engage the auditory learning channel. 5) Multiple repetitions of applying concept/ process. 6) A simulated going-to-the-board experience which provided an opportunity to dissect the problem solving process. 7) Teaching/demonstrating the concept in a simulated teaching exercise.

The CPR-L process incorporates elements of Blooms Taxonomy and The Learning Pyramid. It requires students to solve homework problems that contain core course concepts using a particular sequence of rubrics, and recording the process on a tablet PC. Rubrics ensure the efficacy of core course concept application. The tablet PC records not only the audio component as the student describes what is transpiring, but visually captures each pen (stylus) stroke of the problem solving process. Intense reflection on problem elements, potential solutions, and application of core course concepts are required to produce an acceptable performance recording. More importantly, it maintains the integrity of the problem solving process. Repetition is required to distill the problem solving process to a short, succinct audio/visual presentation that is reviewed by instructors who can isolate student and course content weaknesses, recommend intervention, and better predict examination outcomes.

The CPR-L process has **three (3) components**: (1) technologies, (2) problems that embody core course concepts, and (3) instructional rubrics for problem solving. The innovative deployment of these components, including the opportunity to assess cognitive learning at multiple levels, is what makes CPR-L such a powerful tool.

(1) **Technologies.** CPR –L utilizes the technologies of Smart boards, wireless projectors & tablet PC's to simulate a "learning by demonstrating/teaching" or "going to the board" experience.

**Tablet PC's** are used to fulfill a requirement to produce a **video recording of the problemsolving process,** forcing students toward solitude and focus, and to develop an appreciation for the number of iterations required to distill a short succinct presentation. The end product is a **Competence Performance Recording of the student's grasp of course subject matter.** (Mock, 2004; Neal & Davidson, 2008; Harrison, 2009).

(2) Course Problems that Embody Core Course Concepts. A critical component of CPR-L is course content that encompasses core concepts aligned with national standardized tests. This sets the stage for discussion, homework, and examinations aimed at not only learning course basics, but also continually preparing students for performing well on national standardized test instruments.

(3). Instructional Rubrics for Problem Solving: Fourteen (14) rubrics that encompass Bloom's Taxonomy's six levels of learning navigate the student through a 4-step process for the proper procedure for analytically solving problems, and counter students' preference for a "plug and play" approach.

Rubrics were validated using the eight-step process documented by Allen and Knight (2009) in *A Method for Collaboratively Developing and Validating a Rubric*, published in *International Journal for the Scholarship of Teaching and Learning*. The four (4) steps are **a**) **Articulation** of the problem to demonstrate a grasp of "givens", "unknowns", and what is being sought; **b**) **Analysis** and assessment of information and processes required to solve the problem; and **c**) **Ascertaining** a solution – solving equations and/or correlating data to derive a conclusion. Rubrics ensure that the appropriate process is followed, and consistency in measuring student performance throughout the process, as well as consistency among instructors. **d**) **Application** entails having students develop their own problem that encompasses specific knowledge gained from theory, and effectively closes the learning demonstration process. Rubrics also provide a performance measurement tool based on 4 degrees of compliance that are clearly articulated.

Measurements range from "target level" at 5 points to unacceptable performance at 0 points. (Bloom, 1984; Brown & Kelly, 1997; Wozniak, 1995; Paulson, 1999; Ertner and Stepich, 1999; Ertner, Belland and French, 2009; Hersh, 2006; Reeff, et al, 2006; Weimer, 2012; Blumberg, 2009; Synder, 2008).

## **Rubrics Process and Components**

The four steps in the process are **Articulation**, **Analysis**, **Ascertain solution & Application**. Each set of rubrics in the three-step process produces specific performance measurements.

**Step I**, **Articulation**, is supported by 5 rubrics. When done at *target* level, **it is clear that the student has a thorough understanding of how to read with comprehension and can interpret what is read.** 

In **Step II**, four (4) rubrics support **Analyze and Assess**, wherein students must familiarize themselves with the "unknown entity" and identify all parameters that are needed to solve for the "unknown entity."

When done at *target* level it is clear that the student has a thorough understanding of all concepts and equations, knowns and unknowns, how each parameter is obtained, and how all elements are correlated.

**Step III**, **Ascertain solution**, is supported by three (3 rubrics). When done at *target* level, it is clear that the student has a thorough understanding of how to solve equations (math or chemical), assess and correlate data, dimensions, and units; and draw appropriate conclusions.

**Step IV. Application.** Application is supported by five (5) rubrics. When done at *target* level, **students develop their own problem that encompasses specific knowledge gained from theory, and effectively closes the learning demonstration process**. It is recommended that **Step IV is implemented for only those students who have completed Steps I-III at** *target* **level**.

A document – Rubrics-CPR-L – provides a detailed listing of how to measure each step in the process on a scale of "meets target" to unacceptable.

Example of Instructional Problem Solving Rubric. .

5 Rubrics that support	1.	Articulates thorough understanding of the application of
Step I: Articulate		the problem
	2.	Includes a complete sketch for articulation
	3.	Includes all of the pertinent data points on the sketch
	4.	Clearly delineates all of the data that is given (known) in
		the problem on the sketch
	5.	Clearly delineates the unknown entity that is requested
		from the problem on the sketch
4 Rubrics that support	1.	Thorough understanding of the concepts and equations
Step II: Analyze and		associated with the known & unknown entities
Assess	2.	Thoroughly identifies all parameters that are needed to
		solve for the unknown entity.
	3.	Thorough understanding of how each parameter for
		solving the "unknown entity" can be correlated with a
		datum point found within the problem set
	4.	Thoroughly demonstrates how each parameter can be
		obtained, and can indicate whether it is obtained directly,
		indirectly, or is implied
3 Rubrics that support	1.	Can thoroughly identify each dimension of measurement
Step III: Ascertain		addressed in the problem
solution	2.	Can thoroughly demonstrate that identical dimensions have
		been converted into identical units
	3.	Can thoroughly solve equation (math or chemical) or
		assess and correlate data to indicate a conclusion
5 Rubrics that support	1.	Can construct a new problem that reflects and integrates
Step IV: Application		concepts used in the solution of the homework problem;
		that provides a sufficient amount of "known" information
		to make the problem solvable. The new problem does not
		appear in the textbook, Google."turn-it-in" software, nor is
		it too aligned with any homework problems.
	2.	Can thoroughly articulate the problem as prescribed by
		Step I rubric .
	3.	Can thoroughly analyze and assess the problem as

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prescribed Step II rubric.
4. Can thoroughly ascertain a solution to the problem as
prescribed by Step III rubric.
5. Can thoroughly explain how the new problem enhances or
expands learning

## Innovation in Design- Bringing it all together

With CPR-L, students are required to take home homework problems that contain core course concepts, and solve them on tablet PCs following a particular sequence of rubrics. The tablet PC records the students' voice, as they are required to talk through the problem as though they were teaching it in class. The laptop also visually captures the student's work in-progress straight through to its finished form as the problem solution is written on the tablet PC's surface with a stylus.

The final product must be concise, compressed to essential steps, so students are encouraged to first utilize paper and pen to explore solutions until they believe that they have uncovered all elements in Rubrics Steps I and II (Articulation and Analysis), and reduced their findings to an effective description of the solutions process. The entire process is iterative, and requires intense re-thinking of the solution in order to reduce it to its essence and meet other required criteria. The effectiveness of the solution is measured against all twelve (12) rubrics. Further, the process of recording requires a quiet environment, devoid of music and other typical distractions, as well as reading aloud to "hear" ones' thoughts. This effort reinforces the learning process.

**Video and Audio Recordings: an Iterative Process.** Fine-tuned mastery of each rubric is an iterative process, requiring repeated exposure to core course concepts and explorations of alternative solutions. Each process provides the advantages associated with learning through repetition.

Back in class, the instructor has options about how and by whom assignments are to be presented, as each student has a wireless tablet PC. Technologies enable the student to wirelessly project a "movie-like" presentation of the homework assignment, with sound, on a large whiteboard for classroom viewing and discussion. In the student's voice and handwriting, the problem explains itself visually and audibly as it unfolds. Since the student must iron out all of the kinks and fine tune the assignment outside the classroom, this process lessens the amount of time associated with traditional "going to the board" activity, and permits broader classroom participation.

All students' completed assignments are maintained in their performance file, and are accessible to them and to the instructor. This gives both a movie-like review of exactly how well the student understands core course concepts and what the progress trail looks like. Upon careful review of these performance "movies", instructors can isolate student and course content weaknesses, recommend intervention, and better predict examination outcomes. (Bonwell, 1991; Weimer, 2012; Paulson, 1999; Blair & Schwartz, 2007).