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EEG-Related Changes in Cognitive Workload, Engagement and Distraction as Students Acquire Problem Solving Skills.

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Abstract. We have modeled changes in electroencephalography (EEG) - derived measures of cognitive workload, engagement and distraction as individuals developed and refined their problem solving skills in science. Subjects performing a series of problem solving simulations showed decreases in the times needed to solve the problems but metrics of high cognitive workload and high engagement remained the same. When these indices were measured within the navigation, decision, and display events within the simulations significant differences in workload and engagement were often observed. Similarly, event-related differences in these categories across a series of the tasks were also often observed, but were highly variable. The cognitive index termed distraction was quantitatively lower than workload and engagement across all performances, and occurred more sporadically. While the overall power spectral densities during problem solving mainly showed activity in the 3-7 Hz ranges, epochs where DT predominated were often characterized by activity in the 11-12 Hz range. Lastly, a comparison of cognitive indices between individuals with similar probabilistic learning models suggests that individual EEG models of performance will be more complex than probabilistic models of performance.