

**The Contribution of Individual and Social Metacognitive Support
within an Inquiry-Based Learning Environment
to Environmental Literacy, Metacognitive Awareness
and Inquiry Performances**

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Abstract

Environmental literacy may be defined as the capacity to perceive and interpret the relative health of environmental systems, and to take appropriate action to maintain, restore, or improve the health of those systems. The prevalence of habitat and life-threatening environmental problems has motivated environmental researchers to develop education programs that will strengthen environmental literacy among students. As the connection between environmental literacy and metacognition is theoretically promising, this research designed and examined the *Meta-CIC* model. This model is designed to foster environmental literacy through individual and social metacognitive support within an open inquiry-based learning setting. While the individual aspect of metacognition was addressed through explicit environmental metacognitive guidance, the social metacognitive support included an innovative face-to-face collaborative script which involved two levels of collaboration. An online asynchronous forum accompanied the inquiry process as a platform for students to express and practice metacognition.

The goal of the current research was to examine the contribution of the *Meta-CIC* model to the development of environmental literacy. In addition, thorough, quantitative and qualitative examinations of the learning processes that occur while implementing this model expose its advantages or possible disadvantages. Therefore, in addition to the contribution of this model to students' environmental literacy, we examined its effect on students' metacognitive awareness and performances, and students' online dynamic inquiry performances.

For this purpose, 324 high-achieving seventh and eighth grade students from five Israeli junior-high schools, of similar average socioeconomic status, who conducted inquiry projects throughout a full school year, were divided into four study groups according to the metacognitive support method to which they were exposed. Because collaborations have been researched and found important to inquiry learning, all students worked in pairs; therefore, the *Collaborative Inquiry* (CI) was present in all research groups. The two independent variables in this study were the *individual metacognitive guidance* (*Meta*) and the *Collaborative Inquiry Community* (*CIC*). The research groups differed in the instructional method to which the students were exposed: the *Meta* component, which was either provided or not, and the *CIC* component, which was either present or not. This research design generated four

research groups: individual metacognitive support embedded within the CIC settings (*Meta-CIC group*); CIC settings without individual metacognitive support (*CIC group*); individual metacognitive support without the CIC setting, hence only within group collaboration (*Meta-CI group*); and the CI group, which received no individual metacognitive support and was not involved in the CIC setting; this group experienced within-group collaboration only (*CI group*). We employed three kinds of research tools that focused on (a) environmental literacy, (b) metacognitive awareness, and (c) online dynamic inquiry performances. We collected and analyzed both quantitative and qualitative data.

The results of this research reveal the distinct contribution of individual and social metacognitive support to the expressions of environmental literacy. For example, while the individual metacognitive support contributed to students' expressions of *internal locus of control*, *environmental sensitivity*, and *environmentally associated skills and behaviors*, the social metacognitive support contributed to students' frequent expressions of *environmental sensitivity* and *values and attitude*. These results confirm the theoretical relationship between metacognition and environmental literacy, and therefore the importance of developing metacognitive awareness within the context of environmental education.

Similarly, the results also reveal the distinct contribution of both aspects of metacognitive support to students' metacognitive awareness and online performances. This emphasizes the importance of embedding both individual and social metacognitive support within an inquiry-based learning environment, in order to enhance students' perception and engagement in the various aspects of metacognition.

Last, we found that the two metacognitive supports interplay in their effect on the dynamic inquiry performances. These results are important from a pedagogical point of view since they imply that inquiry-based learning curriculum should embed both individual and social metacognitive support in order to increase students' engagement in the inquiry process and understanding of its procedure.