

BAR-ILAN UNIVERSITY

**Contribution of Metacognitive Instruction and Collaborative Learning
to Students' Inquiry Learning Products and Inquiry Performances
within Open Inquiry Based Learning**

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Abstract

120 open environmental inquiry works, written as group works by students from grades 7 and 8, in junior high schools in Israel, served as "raw material" for this thesis. The students' works were written in the framework of Adler's doctoral thesis (2014). The purpose of Adler's work was to examine "The Contribution of Individual and Social Metacognitive Support within an Inquiry-Based Learning Environment to Environmental Literacy, Metacognitive Awareness and Inquiry Performances."

The purpose of this dissertation is to examine the effect and the contribution of metacognitive guidance and inter-group learning, as expressed in certain aspects of students' works.

This examination was carried out in two directions:

- A. Examining the products of the inquiry (a quantitative test based on all the work).
- B. Examining the performances of the inquiry (a qualitative test based on a small number of works).

All students studied in small groups (couples, and in some cases triples) and therefore all were exposed to intra-group learning. Some of the students also learned inter-group learning, that is, initiated meetings between several groups of students. Some of the students received continuous individual metacognitive guidance, and some did not receive such guidance, so we had four research groups - according to the mentoring methods to which the students were exposed:

- A. Intra-group and inter-group learning (Collaborative Inquiry Community) combined with metacognitive guidance - **MetaCIC** (n=35).
- B. Intra-group learning (Collaborative Inquiry) combined with metacognitive guidance - **MetaCI** (n=27).
- C. Intra and inter group learning (Collaborative Inquiry Community) with no metacognitive guidance - **CIC** (n=40).
- D. Intra-group learning (Collaborative Inquiry) only, without meta-cognitive guidance - **CI**, control group, (n=18).

The research questions were:

1. What is the effect of metacognitive guidance on students' inquiry products?
2. What is the effect of inter-group learning on the students' inquiry products?

3. What is the contribution of metacognitive guidance to students' dynamic inquiry performances?
4. What is the contribution of inter-group learning to students' dynamic inquiry performances?

The three hypotheses were:

- A. In groups that will receive metacognitive guidance, the level of inquiry products will be higher than in groups that do not receive metacognitive guidance.
- B. In groups that will receive inter-group learning, the level of inquiry products will be higher than in groups that do not receive intergroup learning.
- C. In a group that will receive metacognitive guidance and inter-group learning, the level of inquiry products will be higher than that of all other groups.

In order to measure the products of the inquiry, 18 indicators were developed; these indicators divided into two groups: 11 **quantitative** indicators and seven **internal suitability** indicators. The purpose of the quantitative indicators was to examine whether there were quantitative differences (according to some parameters) between the works. The purpose of the internal suitability indicators was to examine the degree of suitability within and between the different parts of the work, as well as the ability of students to discern and cope with contradictions that may arise during the course of the inquiry.

Results

- A. Support was found for the first hypothesis: In groups that will receive metacognitive guidance, the level of inquiry products will be higher than in groups that do not receive metacognitive guidance.

In all 11 quantitative indicators, significantly higher mean scores were obtained for metacognitive guidance groups, and for internal suitability indicators, it was found that in four of the seven indicators, the averages were significantly higher in the metacognitive guidance groups.

- B. No confirmation was found for the second research hypothesis: In groups that will receive inter-group learning, the level of inquiry products will be higher than in groups that do not receive intergroup learning.

Of the 18 indicators examined, significant results were obtained in only five indicators. In these, in four indicators it was found that, in contrast to the hypothesis, in groups that received inter-group learning, the averages were significantly lower than those who did not receive inter-group learning. For one indicator, it was found, according to the hypothesis that in the groups that received inter-group learning, the average was higher than groups that did not receive inter-group learning.

C. Partial confirmation was found for the third hypothesis: In a group that will receive metacognitive guidance and inter-group learning, the level of inquiry products will be higher than that of all other groups.

As for the quantitative indicators, it was found that in nine of the indicators, in the MetaCIC group, the level of the inquiry products were significantly higher than in the CIC group or in the CI group. However, contrary to the hypothesis, no findings were found showing higher products (in quantitative indicators) in the MetaCIC group compared to the MetaCI group. As for the internal suitability indicators, it was found that in four of the seven indicators, in a group with metacognitive guidance and inter-group learning (MetaCIC group), the level of the inquiry products were significantly higher than in the CIC group or in the CI group, but not in accordance with the hypothesis, no findings were found showing higher products (in the internal suitability indicators) in the MetaCIC group compared to the MetaCI group. In addition, not in accordance with the hypothesis, it was found that in one indicator, in the MetaCI group, the level of the inquiry product was significantly higher than the MetaCIC group.

D. Findings from the qualitative part (inquiry performances)

The qualitative analysis of the works was done in order to examine the contribution of metacognitive guidance and the inter-group learning to the performances of dynamic inquiry. The qualitative analysis included four works (one work per research group) and was based on the final works and the documentation accompanying the works (correspondence between the supervisors and the students). The analysis of the works was done according to the four characteristics of the dynamic inquiry (Zion, 2004b): 1.Changes occurring during the inquiry, 2.Process learning, 3.Procedural understanding, 4.Emotionally Involvement.

The metacognition analysis shows that the works from the metacognitive groups: MetaCI and MetaCIC groups, received more references to items (of medium and

high levels) research characteristics than those in the works from the two groups that did not receive metacognitive guidance: CIC and CI groups. The number of times references to dynamic research characteristics (at the levels mentioned) were found in the works from metacognitive groups was approximately two times higher than those in works from the other two groups, (32 vs. 17).

On the other hand, there was almost no difference in the number of references to items in the dynamic inquiry characteristics between the works from the groups that received inter-group learning: CIC and MetaCIC groups, and the works from the groups that did not receive inter-group learning: CI and MetaCI groups, (25 vs. 24). These findings are consistent with what was obtained in the quantitative analysis (inquiry products).