

# **A Geochemistry Curriculum For High School Chemistry Students**

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## **Conclusions (instead of Abstract)**

This project established geochemistry as an optional curriculum for high school chemistry teachers. As a result of the project, a curriculum package was produced and a pilot study encompassing 572 students was conducted. In preparation for the new curriculum, teacher-training courses were held in two stages. In the first stage, 40 teachers were trained in the more basic skills and concepts of geology. In the second, more advanced stage, 18 teachers were trained specifically for teaching the new curriculum.

As a result of the extensive formative evaluation carried out during this project, the curriculum package was greatly improved and was brought to its present level. In their revised form, the study materials are considerably more structured than in the initial design. This was the result of feedback from the experimental classes. In order to counteract any tendency to stifle the initiative of brighter classes, it is recommended to incorporate individual or group project work based around the field trip. This is to encourage students of different levels and different abilities to express originality within the more structured general framework of the course. Each of the components is now in a state suitable for mass production in preparation for wide scale implementation. In summarizing this report, a number of aspects stand out in their importance, and they will be reviewed in the following paragraphs.

The curriculum "The chemistry of the rocks and minerals of Israel" contributed greatly to the world the knowledge of the students who studied it. As a result of the opening up of new vistas on chemistry and on the earth environment, fields which had hitherto been largely closed worlds the students, large cognitive gains were made by most students. They had significantly improved (statistically) the state of their knowledge and had attained a good level of achievement.

Affective changes were not marked. The change in attitude towards chemistry was the main focus of interest in this respect. Multivariate F calculations showed that there was indeed a change (an improvement) in the students' attitude towards chemistry, but it was not large enough to be registered in the components of this attitude that were derived from the analysis of the Semantic Differential questionnaire. In view of the numerous reports in the literature on the improbability of detecting attitude changes over restricted time periods, this modest change was considered an achievement. The control group did not exhibit any such change.

Equally important as the affective changes registered in the program, was the investigation of the contribution of affective variables to the explanation of the variance in achievement scores. Although neglected for many years, affective parameters are now recognized as strongly influencing cognitive achievement. Supporting evidence for this observation is presented in this report too. The overall power of explanation of the cognitive and affective parameters (indicated in the regression statistics of the regression analysis) was not particularly high. If I.Q. data had been available and had been included in the regression analyses, then the explanative power would probably have risen considerably. However, predictions made with the aid of the equation produced by the general regression analysis would correlate well with the observed scores ( $R = 0.67$ ).

The declared goal of "increased interest and enjoyment in the educational aspects of school trips" was not achieved in this first implementation of the program. This may well have been due to the low percentage of students who participated in a field trip during the period of the course and integrally connected to it (50%). This integration of the subject matter of the course with the school and class field trips is seen as a matter of primary importance by the course developer. It is obviously an aspect of the course, which must be worked on. Teachers must be convinced that the geologically oriented trip is an indispensable part of the course, and that planned relevance to the course is an all-important facet of it.

The research project has explored the effects of studying the course on the chosen student population. This population sample (which studied the course) was shown to be similar to another population sample of the same size which was used as the control group. Both samples, however, were relatively small (281,291) if extrapolation of the findings from these populations to the wider general school population is considered. Further research from the next stage of wider implementation of the program would therefore be fruitful.