

INQUIRY-BASED LEARNING AS A NATURAL VEHICLE FOR CROSS-CURRICULAR INTEGRATION: THE BULGARIAN EXPERIENCE

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Extended Abstract

One of the most serious problems of contemporary education is that it neutralises the potential of digital technologies as intellectual laboratories or vehicles of self-expression, and reduces their role to delivering knowledge and evaluating achievements. A good metaphor for the current situation is (McLuhan): *it is as if we are driving a multi-million-dollar sports car, screaming, 'Faster! Faster!' while peering fixedly into the rear-view mirror.*

The author will discuss the roots and the state-of-the-art of inquiry-based learning (IBL) in Bulgaria as an approach which was first used in the context of an educational experiment (the Research Group on Education, 1978-1989), and is recently being developed within a series of European projects (DALEST, I*Teach, InnoMathEd, Math2Earth, DynaMAT, Fibonacci, Mascil, and Scientix).

The Research Group on Education (RGE) experiment comprised 29 pilot schools, its main goal being to design and implement a new curriculum making use of computers as one of its natural components. The guiding principles of RGE were *learning by doing* and *integrated school subjects*. During the first four years, Informatics was introduced as a part of an encyclopedic education. One of the main integrated disciplines in the primary cycle was "I read, write and calculate". A good example of activities under this subject would be creating a situation in which children would decode a letter (matching numbers with letters), read, write, and code a return message in a motivating context.

An innovative idea for integrating the study of Mathematics, natural languages (Bulgarian, English and Russian), and computer language (in this case Logo) was launched in 1984 with the publication of the textbook *Language and Mathematics* (for 5th and 6th grades).

Designed to show the intersection of language study with mathematical thinking in the context of Informatics, this experimental textbook included problems of translating from a natural to a formal language, of algorithmic description of basic grammar rules, and of ways to extend the Logo vocabulary to several languages. Informatics notions, such as *coding, decoding, tree-graphs, algorithms, variables, tables, procedures, recursion, data*, etc. were applied in the context of playing, editing and creating linguistic games, coding and decoding secret texts, describing and executing algorithms in the subjects of Mathematics, Language and Music. Specifically designed microworlds provided tools for students to deal with these new notions from a procedural rather than a declarative point of view. This has already had an impact on the way we started teaching Mathematics, Literature, Art and Music.

Building a microworld for explorations in Euclidean geometry (*Geomland*) was another important step toward inquiry-based learning. It was launched in 1986 as a language-based computer laboratory enabling students to construct and experiment with Euclidean objects, to investigate their properties, and to formulate and verify conjectures, i.e. to do and discover Mathematics.

The RGE experiment emerged as a model for a technology-prompted educational reform. Although it did not lead to essential changes in the Bulgarian educational system as a whole, RGE laid a good foundation for a number of European projects involving inquiry-based Mathematics and Science education, in which the author has been actively involved.

Good IBL Practices in STEAM Education in the Bulgarian Setting

The current activities of the Institute of Mathematics and Informatics as a centre for inquiry-based Mathematics and Science education (IBMSE) at all levels and in all forms will be discussed and illustrated. Various types of PD courses and events, as well as open access learning environments (*VirMathLab*, *VivaCognita*, and *BG Mascil*) related to Mathematics and its connection with Science and Arts will be presented with the hope of establishing fruitful further collaboration between the educational communities of our countries.

Keywords: inquiry-based learning, cross-curricular integration, technology-prompted curriculum

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