A ROMANTICIZED RETROSPECTION TO THE PAST ?!

A Synopsis on Cornerpoints of LOGO - discussion published in german-written journals

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Abstract
Papert promotes LOGO as a very effective instrument for Constructionist Learning. In the late 80s and the early 90s some critics commented on Papert's ideas and his so called LOGO philosophy written down in Mindstorms [6].
In the presentation our purpose is neither to list every single detail which was discussed nor to explain every issue on which there is disagreement, but to summarize the most significant and controversial aspects which were criticized in order to convey an impression of the dimension of the discussion in Germany.

Keywords Euclidian Geometry, Turtle Geometry, Functional concept, Fundamental strategies

Bender's extensive criticism entitled *Review of the Logo- Philosophy* (original: *Kritik der Logo-Philosophie*) [1] gave rise to further publications. In *Is a criticism of Papert and his Logo-Philosophy enough?* (original: *Reicht es aus, Papert und die Logo-Philosophie zu kritisieren?*) by Schuppar, *Notes on Bender's Review of Logo-Philosophy* (original: *Anmerkungen zur "Kritik der Logo-Philosophie"*) by Ziegenbalg and *Consequences of Bender's review* (original: *Benders Kritik und die Wirkung*) by Löthe, the authors refer to Bender's article and his ideas [5, 7, 10]. Finally we also mention one article by Struve which deals with the relation between the traditional Euclidian Geometry and the Turtle Geometry [8].

Before we refer to the reactions of Schuppar, Ziegenbalg and Löthe to Bender's article we first want to pitch on some of Bender's arguments [1].

The LOGO philosophy …

… is an educational utopia containing far-reaching pedagogical aims.

… claims that each child will reach these aims only …

… when using computers early on.

… when working with it extensively.

… implicates the use of the programming language "Logo" in the "right" way.

Schuppar describes Bender's article as the longest, most complete and most in-depth publication dealing with Papert and his philosophy but also the most destructive one. Although Schuppar admits that Bender's paper "may be justifiable in many details" he describes it as "insufficient and simplifying because of its destructive tendency" [7, p. 229]. Due to this destructive basic attitude Schuppar has given the impression that Bender ignores the objectives that have to be achieved, for example *improvement* of the school system and *interaction* with technology. Schuppar also emphasizes the fact that it was Papert who raised many questions concerning the school system of that time (meaning the late 80s) and the teaching of mathematics in particular addressing problems which still would be there even if LOGO did not exist.

Ziegenbalg claims in his article referring to Bender that he "is right in criticizing the method by which the „LOGO-Philosophy" was marked by Papert and his followers" [10, p. 305]. However, what Ziegenbalg criticizes is the missing differentiation between the LOGO - Philosophy on the one hand and LOGO as programming language on the other. As indicator for this supposition Ziegenbalg also mentions the lack of distinction between the supporters of the LOGO - Philosophy and those of the programming language. Ziegenbalg is convinced that one has to distinguish between these fields which are, according to him, two different issues fundamentally. Although he agrees with Bender concerning the LOGO - Philosophy (especially in the points where Bender criticizes Papert's weak reasoning), Ziegenbalg disagrees with Benders evaluation of LOGO as a programming language and its qualifications as a tool used in mathematics lessons. Once again Ziegenbalg emphasizes the facts that LOGO is not identical with the Turtle Geometry, and the importance of LOGO when learning mathematics. In contrast to Bender who sees the main advantage of LOGO in the modeling process investigated in the AI research, Ziegenbalg is convinced that LOGO reflects some fundamental concepts of mathematics and teaching mathematics in such a natural way that cannot be found in any other programming language. These include, according to Ziegenbalg, not only characteristics such as *interaction*, *modularity* and *extensibility* but also a *functional* and a *variable concept*. Furthermore Ziegenbalg praises the list data type integrated in LOGO. Due to these characteristics Ziegenbalg refers to LOGO as a very appropriate tool for teaching mathematics unlike Bender who sees the power of LOGO in programming [1].

There is further disagreement about *modularity*. While Bender [1, p. 55] claims that modularity can affect the overview, in Ziegenbalg's opinion modularity can help by structuring to keep an overview.

Löthe criticized Bender by claiming that "his criticism of the so called "Logo-Philosophy" does not differentiate between Papert's educational conceptions on the one hand and Papert influenced computer work at primary level or the Logo work at all levels of educations on the other" [5, p. 315]. Löthe's criticism is based on the lack of differentiation between the fields which are criticized.

According to him the following facts have to be discussed separately:

Firstly, Papert's statements in *Mindstorms*.
Secondly, ideas concerning learning with computers at primary school-age level.
Thirdly, the existence of contents referring to the Turtle Geometry and techniques.
Fourthly, the programming language LOGO which should not always be linked with Papert. It has an independent tradition and use, too.

And finally there are efforts for the use of computers in the classroom.

According to Löthe Bender does not only criticize Papert's *Mindstorms* but also tries to attack the supporters of LOGO's use in the classroom and those of computers in general. Thus, Bender makes his point of view clear concerning computers in school. As a consequence Löthe is convinced that Bender's criticism "[…] can be used by mathematics educators to excuse their own inactivity and non-involvement in this field […]" [5, p. 315]. Finally he also emphasizes the fact that discussions which deal with the innovation of computers in school "cannot be discussed in a competent and proper way by mathematics educators without any own learning and teaching experience and any knowledge of relevant computer science facts" [5].

Last but not least we refer to the article written by Struve entitled *Problems when generating ideas of geometry in School – On the relation between traditional Euklidian Geometry and Turtle Geometry* (original: *Probleme der Begriffsbildung in der Schulgeometrie – Zum Verhältnis der traditionellen Euklidischen Geometrie zur "Igelgeometrie"*). It is the author's intention to present "[…] a different view of knowledge children acquire in school: They do not learn mathematical but empirical theories" [8, p. 257].

In the article Struve first describes mathematical theories and then refers to the ones students learn in school, the empirical ones: Mathematical theories are theories which are built on axioms. Although it is impossible to make statements concerning the reality, the theory can be applied to it because of its real models. On the basis of the oldest mathematical theory, the *Euclidian Geometry*, it is demonstrated that these real models are in fact only ideas. Referring to the empirical theories Struve claims that students in primary and secondary school do not learn general terms and methods but acquire knowledge which refers to situations, phenomena and experiences of a certain area. Struve makes clear his basis for further argumentation: The objective of the theory which is learnt in traditional geometry is aimed at the description and explanation of figures which are treated in class. Therefore, terms and statements relate to these figures directly. This fact indicates that it is not a mathematical theory but an empirical one. Terms of this theory describe real objects.

In the following part of the article Struve refers to geometry taught in school comparing the traditional *Euclidian Geometry* which is called "Zeichenblattgeometrie" [8, p. 265] in German which could be translated as "Sketchpad Geometry" with the Turtle Geometry. Struve's point of view can be described as follows: In lessons of Turtle Geometry students are learning an empirical theory whose aim is the description and explication of figures which are discussed. It is important that these terms and statements of the theory refer to the figures. Struve investigates how these terms of Turtle Geometry can refer to the reality and mentions a few important facts: Using Turtle Geometry first refers to the figures shown on the screen and then reproduces them identically, which distinguishes it from the traditional Geometry.

Another main difference lies in the objectives of each type of geometry: Designing figures on a sheet of paper versus on a screen. Hence, the terms of each empirical theory are referring to two different objects and have two different meanings.

Struve also addresses the problem caused by different applications: Description and explication of geometric figures on a sheet of paper on the one hand, constructing figures on the screen on the other hand. According to Struve this means that the theories can be applied to different situations causing different problems encountered when applying.

Last but not least Struve mentions several reasons dealing with the question of why terms of the Turtle Geometry have other meanings than terms of the geometry explored on a sheet of paper.

Firstly, he refers to the *discreteness* [3] of the Turtle Geometry, explaining that this kind of geometry is discrete and not continuous. There are only a finite number of points (pixel elements) on the screen. Furthermore the commands used in LOGO like FD and RT only accept positive integer values which causes problems which cannot occur using Euclidian Geometry.

Secondly, Struve criticizes how curved lines like the circle are treated in Turtle Geometry and claims that the concept of a circle cannot be formulated using this kind of geometry. Briefly we state that Struve ignores the educational suggestions of Wittenberg in this point [9]. In the book *education and mathematics: mathematics as an exemplary subject in secondary schools* – (original: *Bildung und Mathematik: Mathematik als exemplarisches Gymnasialfach*) the famous mathematics educator Wittenberg emphasizes the approach of regular polygons linked with tangents an approach verging on Turtle Geometry impressively.

In the end we add our point of view to the very controversial discussions before. Our argumentation rests upon the presentations in the publications *Practical experiences and ideas concerning teaching with computers* (original: *Erfahrungen und Gedanken zu Computern im Unterricht*) by Fuchs [2] and *Are computers able to enrich teaching of geometry reasonably* (original: *Können Computer sinnvoll den Geometrieunterricht bereichern?*) by Graumann [4]:

Acting by the philosophy of Constructionism should finally …
… cause fundamental strategies and techniques (Modeling, Algorithmizing) by systematic implementation.
… manifest computers as powerful problem solving tools in several subjects.

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