An online tool for Schematic Mapping in Geography education

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Abstract—A web-based sketch map making tool was created, based on requirements from didacticians, teachers and pupils active in secondary school geography education in The Netherlands.

Index Terms—Sketch map, Schematic map, Education, Design Research, online tool

I. Sketch Maps in Education

If we follow the definition from [1] of *Schematic Maps* as "representing features in a much simplified or diagrammatic form", *Sketch Maps* can be regarded as a specific subtype of schematic map. They have been defined as maps that "are drawn from memory and help us to organize spatial information" [2] and that "show in one glance the essential spatial relations" [3]. Various researchers, as far back as 1955 [4], and more recently [5] and [6], have concluded that in geography secondary education in particular, sketch maps are helping the pupils to structure information, and to distinguish between main and side issues. Their use in education is most prolific in France, where they are called 'croquis'. Elsewhere, their use is fairly uncommon. But since in The Netherlands map production became part of the required domain skills for the final exams in secondary education, they are receiving more attention, and recent research [7] has recognised their potential for Dutch secondary geography education. It was concluded that sketch maps work most efficiently if the students are empowered to create their own sketch maps, because it trains their geographic thinking and helps them connect the knowledge and skills they acquired to the curriculum. Therefore, in the context of a master thesis research [8], we investigated the potential for an online tool for use in a classroom setting.

II. Creating a Sketch Map Tool

Based on initial ideas from literature, a first, mostly non-functional mock-up was constructed. This was critically appraised in a focus group: It was demonstrated to and extensively discussed with five experts in Dutch geography education. We extracted technical- and user-requirements to create a prototype tool.

The requirements for a simple to deploy, easily accessible tool led us to create a prototype using generic web application technology (HTML, Javascript and CSS). It is based on an Open Source drawing tool called *Excalidraw* [9]. The tool was designed to offer basic drawing functionality for creating maps, using on a library of base maps, symbols and annotations. Templates can be loaded by teacher, on which the pupils can then freely add lines, arrows, patterns, colours, text, etc. External images can be included, also to use these as base map data. It also provides flexibility to change and correct common mistakes. The tool also includes the possibility for teachers to create assignments, for different levels of pupils, each with their specific tool settings.

III. User testing

Our prototype was tested in four sessions in different classroom settings: Geography classes in 4th year HAVO (general continued education) and 2nd and 5th year VWO (preparatory scientific education). The tests were executed with different assignments, created by the teacher of the class in question, each with a different level of complexity. These assignments were based on the ongoing curriculum, and the students had access to additional data and sources from their existing teaching materials. Figure 1 shows a screenshot of a resulting sketch map. In total 71 participants were involved in the tests. Afterwards interviews were conducted with 22 pupils and 3 teachers.

IV. Results and continuation

Based on the user tests, we derived the *relevance*, *practicality* and *effectiveness* experienced by both user groups (teachers and students) separately. Both teachers and students appreciated it especially because it made students learn and remember the teaching materials through using the tool. Furthermore, the flexibility in editing and changing sketch maps provided in the tool is seen as a valuable feature. The educational structure that can be provided to students by changing and creating custom assignments was appreciated by the teachers.

Since the first experiment we have been working further, to take the step from a prototype to a usable tool. Although the prototype performed well technically, a main limitation was its unsuitability for touch interfaces and small screens, which we adress in the next iteration. We also plan a more summative
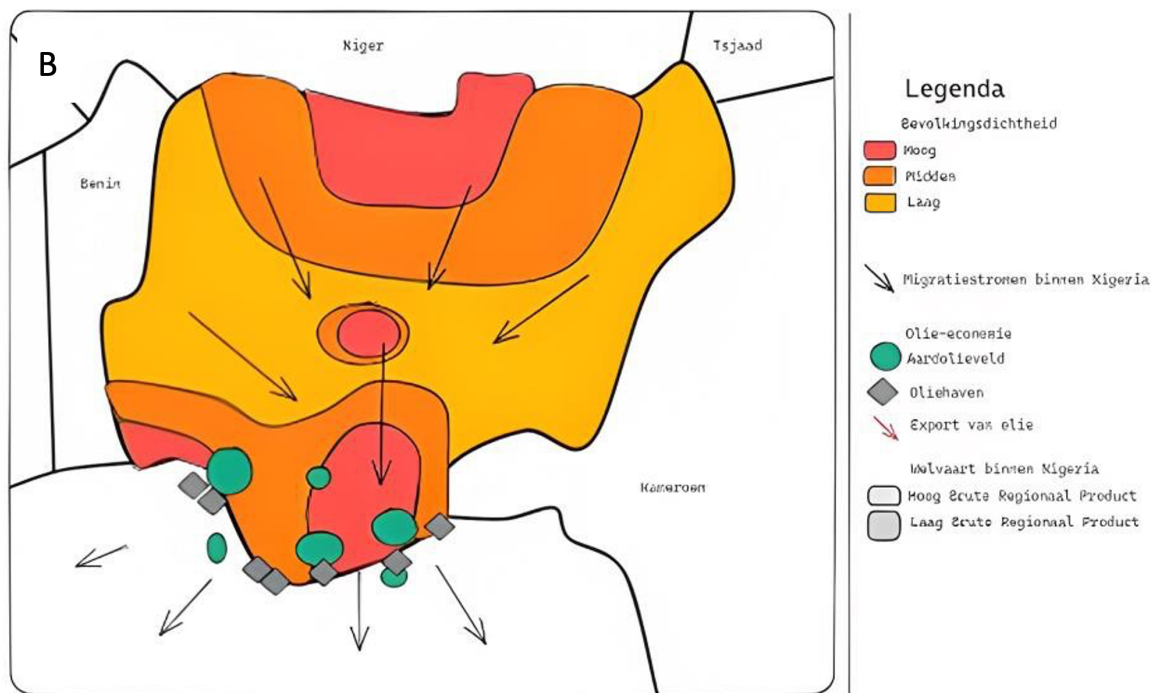
Fig. 1. A screenshot of the tool, with a sketch map on "The economic function of the Niger delta", created by a 4th grade HAVO pupil.

evaluation phase with larger user groups to better prove actual relevance, practicality and effectiveness.

On the poster we will present the design process of the tool and its current state and report on the further development undertaken since its first publication [10].

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