The Web-Based "Swiss World Atlas Interactive": Evaluation of User Experiences

Christian Haeberling, Lorenz Hurni

Institute of Cartography and Geoinformation, ETH Zurich
CH-8093 Zurich, Switzerland

Abstract: Since its launch in October 2010, the "Swiss World Atlas interactive" has become a popular teaching tool for geography instructors in Swiss secondary schools. For teachers as well as for students, this web-based and freely accessible atlas is an ideal complement to the most widely used printed school atlas in Switzerland, the "Swiss World Atlas". After two years of further development, many topographic and thematic map representations of the traditional analogue school atlas are now implemented in the electronic version as interactive 2D maps or as block diagrams. Additionally, most global topics are integrated as thematic layers on a virtual globe. All representations are graphically optimized for screen display and enriched with additional interactive functionality. The user-friendly design of the atlas is suited for most teaching purposes. For instance, thematic maps can easily be controlled by switching on and off map layers, and navigation tools such as zooming or synchronizing are very intuitive. The available visualization modes can be applied in different teaching situations to manifest the full potential of the interactive atlas. Compared to the static maps in the printed version, the flexible use of the interactive representations as wall maps, as illustrations for presentations, or as a source for worksheets implies a high added value for both teachers and students. The current implementation of the interactive atlas is successful, especially due to the user-friendliness of the graphical user interface. The analysis of the server access within the last three years shows a slow but upward trend. In a brief poll more than thirty Swiss geography teachers gave individual information about their current use of the "Swiss World Atlas interactive" for teaching purposes. Most of them are using it as a modern wall map, for individual student work, or as a source to derive teaching materials. Nevertheless, more future promotional activities like workshops or presentations should be initialized to demonstrate the possible applications of the atlas. These efforts in favour of teachers will hopefully generally increase the use rate. The upcoming changes of the

curricula on the secondary school level concerning the geography education in Switzerland must always be taken into account. Additionally, the "Swiss World Atlas Interactive" will be enhanced by new thematic content (e.g. desertification, global migration, climate change) and adapted to a new atlas architecture using HTML 5 technology. Furthermore the optimization for tablet computers as an alternative to desktop or notebook computers is intended.

1. The "Swiss World Atlas Interactive"

1.1. The printed "Swiss World Atlas" as starting basis

The most used printed school atlas in Switzerland, the "Swiss World Atlas", has a 100-year long tradition (Schweizer Weltatlas 2010). This map collection contains over 400 topographic and thematic maps, supplemented by diagrams and other illustrations and following a useful exemplary approach (Figure 1). It is still an indispensable geography teaching aid for the secondary school level (grade 7 to 13) (Marty 2007).
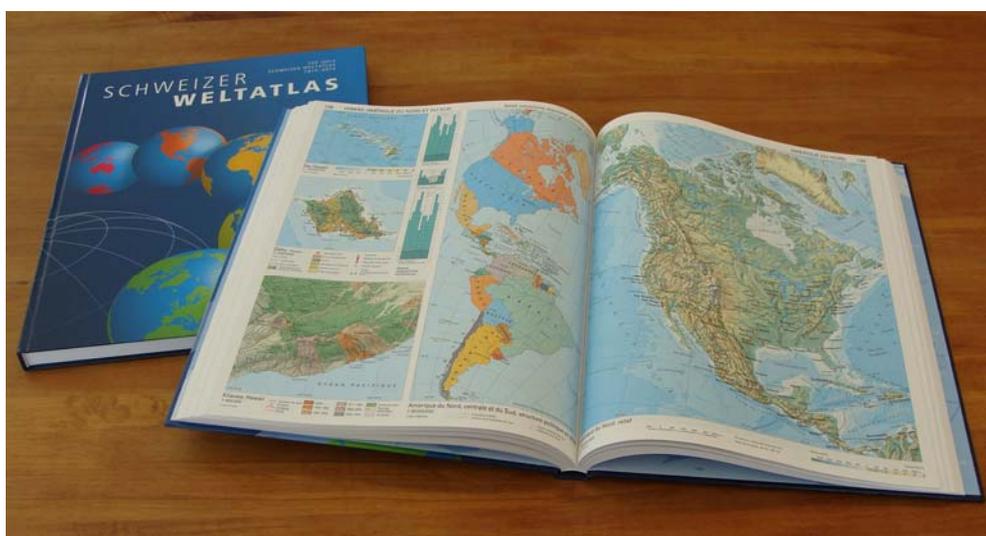

Figure 1. Cover and pages of the current printed "Swiss World Atlas".

Even the cartographic design is still approved, though some of the cartographic representations inherit some weaknesses and deficits. Many of the static maps are too complex (e.g. the maps about the economy) and only

depicted in an orthogonal projection. Additionally, but also obviously, the updates of the map content can only take place at the next revision of the atlas.

1.2. Project of the web-based "Swiss World Atlas interactive"

To face the deficits of the printed version, but also to test the use of emerging electronic media at this time, the publisher of the "Swiss World Atlas", the Conference of the Directors of Education of the Swiss Cantons (EDK), started the research project "Swiss World Atlas interactive" in 2005. The main project goal was the development of a digital school atlas to complement the printed edition.

The Institute of Cartography and Geoinformation at ETH Zurich was mandated to develop a prototype and to evaluate the technical capabilities (Haeberling et al. 2007). Simultaneously the situation at Swiss schools concerning the introduction and the use of electronic teaching media as well as the computer infrastructure was studied. Both the technical preconditions and the motivation of the teachers seemed very promising for a web-based solution using Java and raster data technology (Marty 2007).

Within five years a new web-based and interactive atlas system has been developed and continuously refined. The data of the printed atlas were the ideal initial source to derive most of the cartographic representations. The first version of the innovative "Swiss World Atlas interactive" has been published in October 2010 (Swiss World Atlas interactive 2013).

Since its launch, teachers as well as students can use this web application and ideal complement to the "Swiss World Atlas" for free. At least the graphical user interface with the description of the functionality, the legends, and additional information (e.g. imprint, help function, system requirements) is now implemented in French, German, Italian, and even in English so that the atlas system can be introduced in the classes of all Swiss regions.

1.3. The current content and functionality

As a complement to the printed version, the "Swiss World Atlas interactive" should cover most of the thematic content. A geographic and a thematic index inform the user about content availability. Especially series of worldwide topics like physical topography, political situation, land cover, population density, or specific climatic issues (precipitation, temperature, and wind and sea current systems) can be found. Such maps, with different zoom levels, are also ideal to be visualized on the virtual globe (Figure 2).
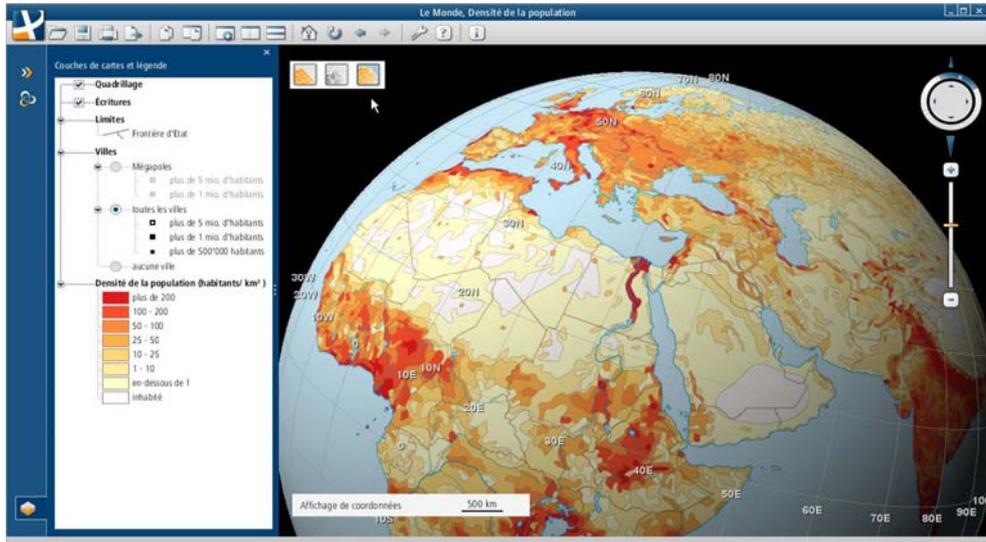
Figure 2. The virtual globe in the "Swiss World Atlas interactive".

Additionally, numerous regional landscapes or cities around the world are already depicted on interactive large or medium scale maps. Many of these maps, primarily those which are showing a mountainous area, are implemented as texture in interactively controllable block diagrams (Figure 3).
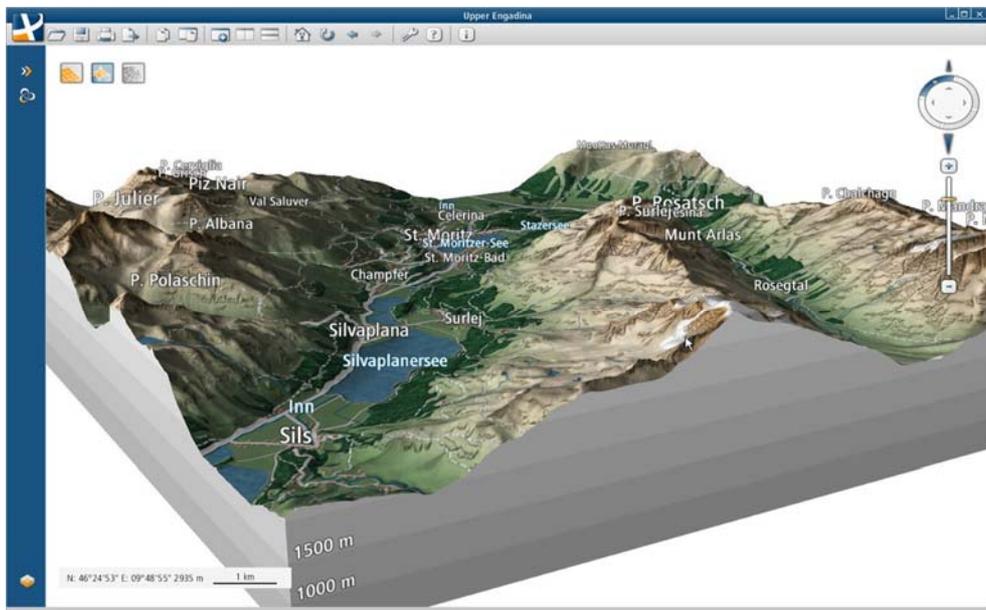

Figure 3. Block diagram with dynamic labeling.

By clicking the mode buttons in the map window, the user can easily switch from the map mode to the available optional viewing mode such as block diagram or virtual globe.

Currently, about one third of all maps in the printed version are already implemented as classic and screen-optimized interactive representations. Most of them are enriched with additional interactive functionality. For instance, interactive maps can easily be controlled by switching on and off thematic map layers and navigation tools such as zooming or synchronizing are very intuitive. With mouse-over effects much geographic information can be requested, e.g. the population of cities or the geographic position of a feature (Figure 4).
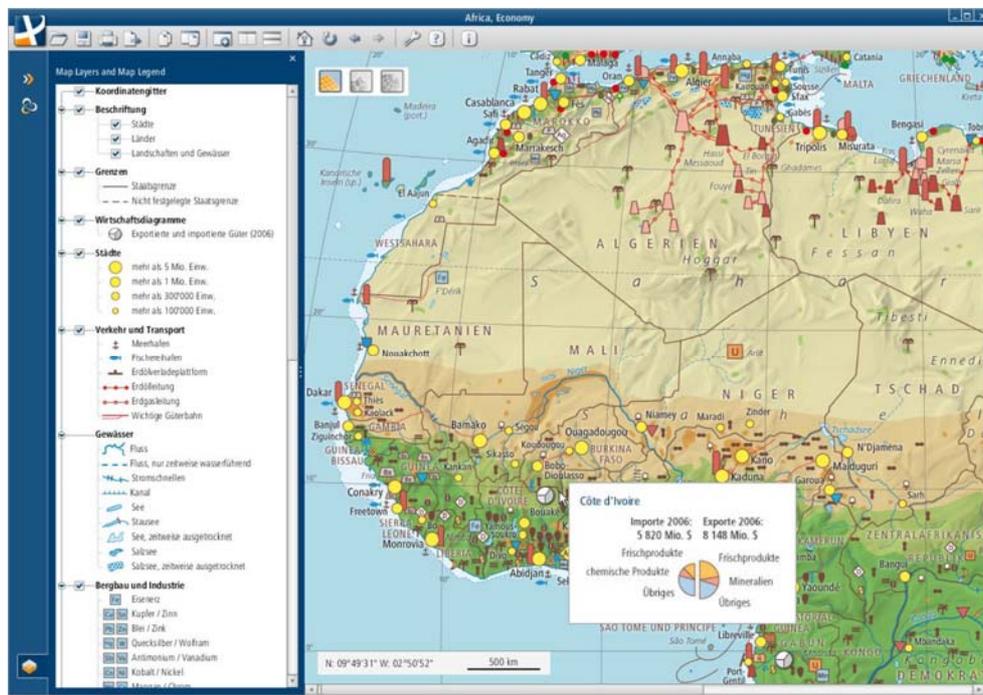

Figure 4. Interactive map with information box by mouse over effect.

2.   The potential and capabilities of electronic media

2.1. Limits of the printed school atlas

When discussing new media as teaching tools we should not forget the advantages of classic printed atlases like the "Swiss World Atlas" with its over 100-year old tradition. The flexibility of use without any other requirements is still unbeatable. For every teacher or student, it is

absolutely the same use situation. Besides the price of purchase, no other costs are incurring. Moreover the handling of a printed atlas is absolutely predictable.

The main drawback is that the map representations are static. Thus, the printed atlas is not adaptable to every teaching topic or use situation. If the content of the discussed map is too complex and dense, the interpretation can be very demanding both for teachers and for students. Last but not least, teachers can't easily reconstruct the students' chains of thoughts.

2.2. Added value of a web-based atlas

In general a web-based electronic school atlas implies a high added value for both teachers and students (Diekmann-Boubaker 2011). In comparison to the static form of a printed atlas, an electronic version can be adapted to the specific teaching situation. If classrooms are equipped with computer and projector installation as well as with reasonable internet access, such a web-atlas can easily be used as a modern wall map. Geography teachers are enabled to explain geographic features and processes directly in front of the class. They can better observe the reactions and respond to the feedback of their students. In this way, students are more involved in the discussion (Bartels 2012).

An electronic atlas can also motivate students to make better use of an atlas as a learning tool and information source. The younger generation of students apply unfamiliar software with higher interest than they would read and analyse an old-fashioned book. Finally, the interactive atlas can be a valuable source for teachers to prepare their lessons by creating worksheets or presentation slides. Many illustrations can be derived from the electronic atlas and can be integrated as exported files in a text or presentation document.

Nevertheless, some undisputable disadvantages of such electronic atlas systems must be mentioned. Undoubtedly, the dependence on functioning technical equipment is quite high. Even though the necessary hard-ware devices and internet access are available at most Swiss schools and private households, their application in classrooms or computer labs is not always warranted. Lack of computer administration rights, cumbersome reservation procedures, or variable internet connection rates could handicap an intended or regular use. Moreover, the preparation of well-elaborated geography lessons (especially the development of new lessons from scratch) could be a very time consuming process. Many teachers avoid these circumstances due to an already high personal workload.

3. Adoption and current use

3.1. Promotional activities

Almost three years after its launch in October 2010, the "Swiss World Atlas interactive" has been established as a well-known teaching aid within the community of Swiss geography teachers. Numerous promotional activities contributed to this broad publicity. To initiate the publication, a press conference was held under the lead of the publisher. In the evening of the same day and after a short report in the TV news at prime time, the web server was overloaded by the huge number of web accesses, not only by teachers but also by the general public.

Many presentations at cartographic conferences and more familiar seminars for teachers were given by the editorial team members. Several days' participation and multiple presentations at two didactic exhibitions provided opportunities to demonstrate directly the atlas and its functionality to geography teachers.

Many articles in journals and notifications in bulletins were published to describe the details with respect to the content, the functionality, or the technology behind the electronic atlas. A couple of workshops were organized to directly instruct geography teachers in how to handle the electronic atlas and how to use it as a teaching tool. In order to be informed about all the progresses of the atlas, interested people can subscribe to a newsletter distributed by email. Since its introduction, several hundred subscribers have profited from this flexible and cost-efficient information tool.

Overall, the editors believe that the activities for promoting the electronic atlas were widely diversified to reach most of the geography teachers in Switzerland as well as other interested professionals who could potentially use the atlas for their activities. Geography teachers as the most important decision-makers should certainly be aware of the existence of the atlas and of its characteristics.

3.2. Current use rate

The periodical and anonymous analysis of server access shows dozens of logins each working day and slightly lower numbers on weekends (when teachers are often preparing their lessons). The number of logins is very variable in terms of the time of day, the days of the week or even the weeks within a year. A basic processor load of two hundred visits can always be registered every week. As one would expect, more hits occur during the day when school lessons are taking place. These quantitative facts illustrate the permanent access of the web atlas by different users. Unfortunately, such

an analysis can't evaluate how the atlas has been used at each session or how useful it was.

3.3. Methods to collect individual opinions and feedback from atlas users

To assess the actual gain of applying a teaching aid, individual interviews or standardized polls are appropriate (Flick et al. 2000). For interviews, questions have to be asked so that answers must be given as text which can be categorized and qualitatively interpreted afterwards. When applying a written or electronic standardized poll, participants can often respond to the questions by a numerical rating. The numerical values of the ratings can be evaluated statistically and qualitatively interpreted as well.

Until a short time ago, no long-range and systematic evaluation of the use of the "Swiss World Atlas interactive" has been carried out. Unfortunately, only rare information about the real atlas use in teaching situations has been available so far. Up to now the only two possible data sources for a quantitative evaluation of the "Swiss World Atlas interactive" were transmitted feedback forms and direct conversations with users.

The assessment of the anonymous user feedback is rather limited. After finishing an atlas session, an atlas user can write some comments in a text field within a very brief questionnaire (Figure 5). However most of these comments do not relate to the usage of the atlas. In the questionnaire, the user is asked about a specific map representation with respect to the content, the different functions, or the general impression. Moreover the user can send feedback about some personal characteristics (teacher? school level?), the atlas functioning (running ability of maps, block diagrams, the virtual globe, or illustrative models?), and their available Internet capacity.

Figure 5. Form of the user feedback in the "Swiss World Atlas interactive".

Personal communication with many geography teachers gave plenty of indications about the daily use or wishes for additional content. Regrettably, such spontaneous discussions were neither systematically recorded nor analysed. All these statements can only provide a rough sketch of the reality of whether and how the web atlas is actually used in geography lessons.

Recently a web based user survey by Lorenzo Oleggini (2013) focussed on a number of interesting issues concerning the introduction and the handling of the "Swiss World Atlas interactive" in concrete teaching situations. This poll was part of an unpublished term paper in the current training program

for future geography teachers. The main goal was to derive a basis for proposing typical geography lessons supported by the electronic atlas. The three question blocks with their nearly hundred sub-questions refer to the publicity of the atlas, to its concrete application for teaching purposes, and to the reasons for or against its use. Due to the limited number of participants (only 31 geography teachers gave analysable answers), the poll was not representative for the current situation in Switzerland concerning geography education at the secondary school level. Nevertheless the results are very informative and the poll can provide a highly valuable basis for future systematic surveys.

3.4. Current atlas use for teaching purposes

The results from the poll by Lorenzo Oleggini (2013) confirm quite well the impressions of the informal feedback from geography teachers. According to the written answers of all 31 responding teachers, the most significant conclusions are briefly summarized here.

The general situation can be described as follows:

- Most of the teachers are using a printed school atlas during their geography lessons (98%), especially the printed Swiss World Atlas (94%).
- More than one third (37%) of them were using electronic atlases before the "Swiss World Atlas interactive" was published.
- 28 of 31 teachers (91%) know the "Swiss World Atlas interactive" quite well.
- 23 of 31 already have used the electronic atlas for their teaching.

The 28 teachers who already know the "Swiss World Atlas interactive" confirmed also that they use the atlas for the main intended teaching purposes, mostly applied in combination:

- As projected and interactive wall map in the classroom (18 positive answers).
- In combination with the printed atlas version (10).
- For students' individual work or exercises in a computer lab (7).
- For students' home work (3).
- As a tool to prepare lessons or to derive teaching materials (19).

There are specific reasons why some teachers avoid using the atlas:

- They might have no idea or intention to introduce the atlas into the classroom (5 answers).
- They see no added value of the atlas in comparison to the printed version (5).
- Only one teacher avoids consciously the hassle of reserving of the computer lab at his school (1).

4. Conclusions

Even though the results gained from the poll are approximate and coarsely interpreted, they illustrate at least that the "Swiss World Atlas interactive" plays a vivid role in the geography education in Switzerland. Maybe the expectations concerning the actual atlas use by teachers or students were higher in the beginning. Nevertheless, the previous use is quite on a remarkable level.

More systematic and detailed surveys will need to establish whether and how intensely the atlas is introduced in the lessons or how it is used to derive teaching materials. Additionally, the promotional activities could be extended. More workshops and demonstrations for geography teachers will certainly increase the adoption rate.

Before, the general situation of geography education in Switzerland must be considered very carefully. The curricula of geography education at the secondary school level are currently debated. Reductions of the number of lessons for different school grades as well as a thematic shift towards social and/or historical issues are general trends. A school atlas like the "Swiss World Atlas interactive" has to anticipate these developments.

Concerning the general move of computer technology from desktop or laptop computers towards mobile devices, new challenges have arisen. How should schools deal with the new generations of tablet computers or smart phones? What will be the specific consequences for an electronic atlas with respect to the content, the functionality, the display and the cartographic design? Last but not least, how will atlas users (teachers, students, interested persons) adapt to such modifications? To build on the promising introduction of the "Swiss World Atlas interactive" for coming years, it has to be aligned constantly to the future user needs.

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