

# GAMIFICATION OF GEOINFORMATION IN SWISS EDUCATION & RESEARCH

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**Abstract.** The Swiss Education community in GIS is a well connected community which shares ideas, material and applications between research and education. This paper presents parts of this community content with the goal to share it at Esri User Conference 2015.

**Keywords.** Spatial thinking, geogames, location-based learning, storymaps, crowdsourcing, GIS in secondary school

## 1. Introduction

Swiss Schools got in touch with concepts and ideas of GIS since many years. A first remarkable initiative happened when teachers of the first GIS book for K12 –schools were invited at the Esri User Conference 2007, where VSGg and the authors of the first GIS teaching material for schools - Raymond Treier, Carmen Treuthardt Bieri and Michael Wüthrich - received the "Special Achievement Award in GIS". Raymond Treier is still convinced that thanks to GIS, the analysis capabilities of the networked world provides a new quality in the classroom and enriches the spatial consciousness of young people and gives Geography a new platform. Many projects mostly in STEM education and research got initialized from that time.



*Fig.1: Raymond Treier receives the "Special Achievement Award in GIS" of Jack Dangermond*

With the fast-evolving GPS - Devices, WebGIS - technology and geodata - access from the web, Swiss Schools profit nowadays from a large choice to execute geoinformation in their curricula. Learning with Desktop GIS is still the most established method in Swiss schools thanks to the teaching material, but with the development and adaption of mobile telecommunication technologies (JAMES-Study 2014, ZHAW), learning content can be accessed virtually anywhere and at any time, which enable new opportunities for education and research. There have been some studies analyzing the effectiveness of tablets for education. (Browne et al., 2014)

One important purpose of the largest Swiss GI Business congress (GEOSummit) organization was addressed to the next generation by sharing GIS to Schools. An Education committee of Educators got the idea to transfer GIS to the young generation with GeoGames or gamified GI applications. The first Swiss GEOSchoolday was born with a remarkable collection of games and applications and a huge real-time game with more than 100 participating students executed in the Bern, the capital city of Switzerland.



*Fig. 2: GEOSchoolday 2014 in Switzerland: GEOSchool Forum, GEOSchool Corner, GEOSchool Outdoor games and MegaGEOGame*

## 2. Goals

Within the application for the Esri User Conference 2015, we want to present our recent applications, case studies and experiences together and share our ideas about gamification of gis education to an International Edcommunity which the Esri User Conference makes possible.

## 3. Applications and Case Studies

The following case studies is well-known selection of Swiss GI activities in Education and will be part of the Swiss presentation at Esri User Conference 2015.

### 3.1. Esri Summercamp in Switzerland: GIS in the Wilderness: Fun in Education & Research

Organisation: Esri Switzerland (Swiss Parks)

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The Swiss Esri Summercamp is a one week camp with the goal of learning GIS techniques and engage to spatial thinking in a natural and scientific context of an outstanding beautiful environment. The first camp was conducted at 2009 in collaboration with the Swiss Nationalpark, the association of the Swiss Geography teachers (VSGg) and GLOBE-Swiss (Program for Global Learning and Observations to Benefit the Environment). Students from all over Switzerland could apply for this unique camp by a motivation letter. The full range of GIS get presented day by day: Day 1 starts after introduction-games like geocaching with the project design and database implementation as preparation for day 2, the field work data collection. Day 3 stands for data analysis and pattern recognition of the own data compared with the professional park information. Day 4 is mostly a GIS-free day with a longer hiking tour to clear their minds and get them the opportunity to engage deeper in the wilderness of the Nationalpark. Day 5 are used to create the final maps publish the as posters as well as upload the results to ArcGIS Online. At the final day 6 are the student's project presentations for the park administration, parents and visitors. Admittedly, the real gamification approach of these summercamp is less obvious. More the working engagement, field collection and intermediate fun elements of this gis camp are substantially important for learning GIS and have brought to the six year old camp series the needed success to continue another decade.

More information about Esri Summercamps at <http://schulgis.ch/>.

### **3.2. GeoGames in Education -or Maps of the Swiss Confederation are so much fun!**

Organisation: swisstopo

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[www.geo.admin.ch/edu](http://www.geo.admin.ch/edu) is an initiative to enable geodata usage (of the Swiss Confederation) for educational purpose. The focus is teaching material targeting primary/secondary level based on the function of the free map viewer [www.map.geo.admin.ch](http://www.map.geo.admin.ch): Introductory material “How to use map.geo.admin.ch” and examples for standard teaching situations are described in a ready-to-use manner. Target groups are teachers and pupils. One method to draw attention of kids to maps is the use of the concept of “StoryMaps”. Students will learn “what maps are” with the gamification approach, such as the SwissGuesser-Game and that geodata of the Swiss Confederation are fun!

More information about the Geoportal at [www.geo.admin.ch/](http://www.geo.admin.ch/).

### **3.3. OMLETH: An integrated Learning Management System for location-based mobile learning**

Organisation: ETH Zurich, IKG (Esri Development Center)

Author: Christian Sailer, c.sailer@esri.ch

This project targets the development and evaluation of a platform for location-based mobile learning. It aims at closing the gap between the theoretical study of place-related teaching content, and students’ direct experiences at the respective location. As an add-on to existing didactical concepts (e.g. like the following GISsmox project suggests), the platform allows to create location-based learning modules, which can later be used in a mobile app. The gamification aspect in this projects is on the one hand the collaborative way of executing the modules app between the users (notifications form users, data collection, content caching) and on the other hand to achieve the tasks the modules demands by rankings. The platform as well as the app are developed with ArcGIS Online and Esri’s Javascript API, HTML5 and CSS3.

More information about the Learning System at <https://omleth.ch>.

### **3.4. The GISsmox project**

Organisation: ETH Zurich, Department of Environmental Systems Science

Author: Urs Brändle – Monika Niederhuber – Daniel Trüssel – Franziska Baumgartner – Arsin Grünig

The development of the platform “ArcGIS Online” and the “Collector for ArcGIS” app along with the prevalence of mobile devices with integrated GNSS (global navigation satellite systems, e.g. GPS) receivers opens up novel

possibilities for collection, visualisation and interpretation of spatial data in a teaching context.

In the GISsmox (GIS supported mobile outdoor experiments) project, the mentioned technologies allow groups of students to acquire large datasets in a crowd-sampling approach on field trips. Furthermore, they can then conduct real-time analysis of their own data on site using their smartphones or tablets. Collecting spatial data on site in real-time and comparing it to available information in order to discuss answers to relevant questions offers a much more active learning experience than existing classical approaches on field trips usually do. Additionally, visual information based on augmented reality can be added to enhance the learning effect. For this purpose, the freely available augmented reality app “Layar” is used.

For example, in one of the case studies, students were measuring and mapping wind speeds and directions 1 m and 3 m above ground on a planned wind turbine site to better comprehend the “phenomenon wind” and to answer the following questions: How variable is the wind close to the ground? Is the wind speed at 3 m above ground already considerably higher than 1 m above ground? Does the wind follow the terrain? Moreover, the future wind turbines were displayed as 3-D objects in the Layar app so that the students got an impression of the impact of the turbines on the landscape aesthetics.

Further similar excursions were conducted studying soil properties, breeding places of tiger mosquitoes and the spread of invasive neophytes. Many other possible applications can be thought of.

Both, OMLETH and GISsmox, are projects sponsored by the Innovedum Fonds of the ETH Zurich ([www.innovedum.ethz.ch](http://www.innovedum.ethz.ch)).

### **3.5. Experiences from a gamified mobile web application for crowdsourced geographic data collection**

Organisation: HSR Rapperswil, Geometa Lab

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Gamification is a recent concept of applying game design elements and techniques in non-game contexts. The goals of gamification are manifold: Raising user motivation and engagement, strengthening customer or brand loyalty, or increasing awareness. Even in crowdsourcing of open data projects like OpenStreetMap there are many reasons to apply gamification, like to enhance the data quality (completeness), to motivate new users and communities to engage themselves or to revive interest (“mappers” who temporary gave up).

With these goals in mind, our lab invented a mobile web app called Kort which simply is the Danish word for “map”. The main idea is to reward users with virtual money (called “Koins”) after they have successfully completed a

“mission”, which consists in answering the real world name of a restaurant or the pavement of a street. Users get badges and can follow their ranking in a high score.

Kort was translated into over 20 languages. It is location based, needs no installation and has a responsive user interface (HTML5). The implementation is entirely based on free or sponsored cloud services. This contribution reports some statistics and discusses the experiences made so far.

More information about HSR at <http://geoinformation.hsr.ch/index.php?id=9938>

### **3.6. Map-your-world and see-you**

Organisation: FHNW Muttenz, Institute of Geomatics Engineering

Author: Prof. Hans-Jörg Stark, [hansjoerg.stark@fhnw.ch](mailto:hansjoerg.stark@fhnw.ch)

Since 2009 when we first started with the open geodata platform [open-addresses.ch](http://open-addresses.ch) to collect geo-referenced building addresses through crowdsourcing as a volunteered-geographic-information (vgi) project until now we have developed several projects both for volunteers and especially for secondary school students. The project “Map Your World” (MyW, [www.map-your-world.ch](http://www.map-your-world.ch)) introduced the concept of vgi and gave students the opportunity to collect their own data and integrate it into OpenStreetMap (OSM). Base on MyW we developed the platform [www.see--you.ch](http://www.see--you.ch). Within this project students carry a GPS-logger for a specific time like a week and then the collected data is uploaded onto a server and processed and provides an online map as heat map to present the mobility of the students, their favorite leisure locations etc. It also comes up with an analysis of their relations – who spends more time with whom – and thus focuses and raises the question of privacy and geo-information. Within the See You project data has also been analyzed with the powerful tools of ArcGIS. E.g. in a project students analyzed their ways and mobility when visiting the local zoo in Basel, Switzerland (cf. [www.see--you.ch](http://www.see--you.ch)).

The latest project deals with noise pollution and allows for the students to “noise-map” their environment with their smartphones. Based on geo-spatial and mobile technology the issue of noise pollution is presented not only in theory but also in practice and discussed with an online map (cf. [www.see--you.ch/decibel](http://www.see--you.ch/decibel)).

## **4. List of Swiss Projects, Events and Blogs**

The following list is only a well-known selection from March 2015 and provides no guarantees on completeness about GIS activities in Switzerland:

#### First Swiss GEOSchoolDay:

- Website: <http://geoschoolday.ch/>
- Metasite: [http://giswiki.hsr.ch/GEOSchool\\_Day](http://giswiki.hsr.ch/GEOSchool_Day)
- MegaGEOGame: <http://geoschoolday.herokuapp.com/>

#### Esri Sommercamp 2009 – 2014

- <http://schulgis.ch/>
- <http://www.esri.ch/branchen/bildung-und-forschung/sommercamps>

#### ArcGIS Online for Swiss Schools

- <http://schoolgis.maps.arcgis.com/home/>

#### Kantonsschule Solothurn (Center of Excellence)

- “Geografische Informationssysteme (GIS)” “Special Achievement in GIS”  
– Award: <http://old.kssso.ch/index.php?id=493>
- Digital Earth <http://old.kssso.ch/index.php?id=1180>

#### Swiss confederation:

- StoryMaps: [http://www.geo.admin.ch/internet/geoport/en/home/topic\\_thematic\\_portals/storymaps.html](http://www.geo.admin.ch/internet/geoport/en/home/topic_thematic_portals/storymaps.html)
- EduGame SwissGuesser: <http://storymaps.geo.admin.ch/storymaps/story-map10/?lang=en>

#### Geoinformation at University of Applied Sciences of Eastern Switzerland HSR, Institute for Software

- Website: <http://geoinformation.hsr.ch/index.php?id=9938>
- KORT: <http://www.hsr.ch/Kort.13199.0.html>

#### SummerSchool and projects 2009 -2014 at Institute of Geomatics Engineering at University of Applied Sciences Northwestern Switzerland

- <http://ivgi.blogspot.ch/2014/08/geomatik-summer-school-2014.html>
- <http://ivgi.blogspot.ch/2013/09/geomatik-summer-school-2013.html>
- <http://ivgi.blogspot.ch/2012/09/erfolgreiche-geomatik-summer-school-2012.html>
- <http://ivgi.blogspot.ch/2011/07/geomatik-summer-school-2011.html>
- <http://ivgi.blogspot.ch/2010/07/geomatik-summer-school.html>
- <http://ivgi.blogspot.ch/2009/07/geomatik-summer-school-2009.html>
- [www.map-your-world.ch](http://www.map-your-world.ch) / [www.see--you.ch](http://www.see--you.ch) / [www.see--you.ch/decibel](http://www.see--you.ch/decibel)

#### Summerschools at ICTM, Biel (in collaboration with Esri Switzerland)

- <http://gisig.blogs.esri.de/2014/07/gis-summer-school-am-ictm-biel.html>

## **5. Conclusion and Outlook**

### **5.1. Collaboration is needed**

Switzerland is small country with the consequence of very high effort in creating new country-specified teaching material (like the school book) or applications (several presented) for only a relatively small given revenue. The education market for GIS requires cooperation in order to generate general awareness in schools.

To increase the awareness of Geoinformation in Swiss Schools, many Educators as presented in the case studies from Higher Education, Federal Administration and Esri Switzerland have started a campaign at summer 2014 by creating a first event called GEOSchoolDay in Bern, the Swiss capital of Switzerland, in introducing GI-Technology with games or gamified applications.

The design of this collaboration is implemented by the GEOSchoolDay and is supported of the Swiss organization for Geographic Information (SOGI) as well. Bringing together the best concepts and ideas of Geographic Information Education – both ArcGIS Technology and enhanced with Open-Source Technology carried by localized data of Volunteered Geographic Information like Open Street Map, open data in general and hopefully in future more Swiss Open Government Data for Education, returns the efforts sustainable for the current teacher generation which are taking over are the investments and work for GI Education.

### **5.2. Proposition for the “Education & Research part” of Esri User Conference 2015**

Esri Switzerland and the Geometa Lab of the University of Applied Sciences of Eastern Switzerland will repeat the GEOSchoolDay in 2015. With the experience and a good understanding of those day as well as further joint campaigns, we would like to present and discuss these concepts and location-based apps at Esri User Conference 2015.

### **5.3. Swiss GI Session**

Referred our presentations p.e. as the term “Swiss GI Session” we could start the ideas by a short introduction of each educator in the conference hall, consider the possibility of moving outside together with the audience to execute the ideas hands-on station by station At the end the conclusions and discussions are again back where the session was started.

Time	What	Where
30'	Ideas and Concepts	Indoor
60'	Hands-on Workshops	outdoor
30'	Conclusion and Discussion	indoor

*Tab 1: Proposition of a Swiss GI Edu-Session*

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