Games !

Dr. Christian Sailer

Enhancing knowledge, skills, motivation and spatial reasoning through location-based mobile learning experiences

eduhub days 2022
February 15 & 16, 2022, Gather.town & Zoom

ETH Zurich
Department of Civil, Environmental and Geomatic Engineering

1. **Introduction to outdoor pedagogy and geotechnologies**

2. **Geotechnologies to promote learners' agency**

3. **Effectiveness of the use of geotechnologies in formal education**

4. **Discussion**

1. **Introduction to outdoor pedagogy and geotechnologies**

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4. Discussion

Think about your outdoor (learning) activities?
What types of activities do you know and do you like?

Outdoor Learning is an umbrella term for **actively inclusive facilitated approaches** that predominately use **activities and experiences in the outdoors** which **lead to learning**, increased **health and wellbeing**, and **environmental awareness**.

Field trip

Wikipedia says…

A **field trip** or **excursion** is a journey by a group of people to a place away from their normal environment. It gives the people experience things concretely and authentically….

…culturally enriching field trips led students to show a greater interest in arts, greater tolerance for people with different views, and boosted their educational outcomes (Erickson et al. 2022).

-> outdoor education
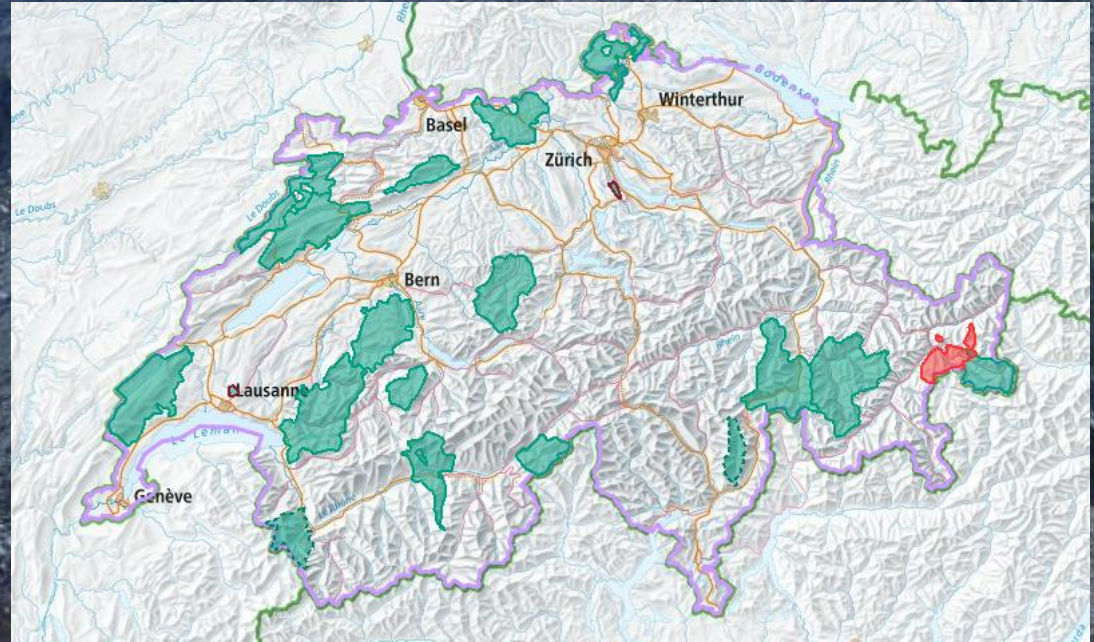
Swiss National Park
Geoscience Camp Series

Explore, Collect,
Measure, Desribe

Collaboration, Co-construction, reflection, and peer assessment

Classification of the Field trip (Hemmer and Uphues, 2009)

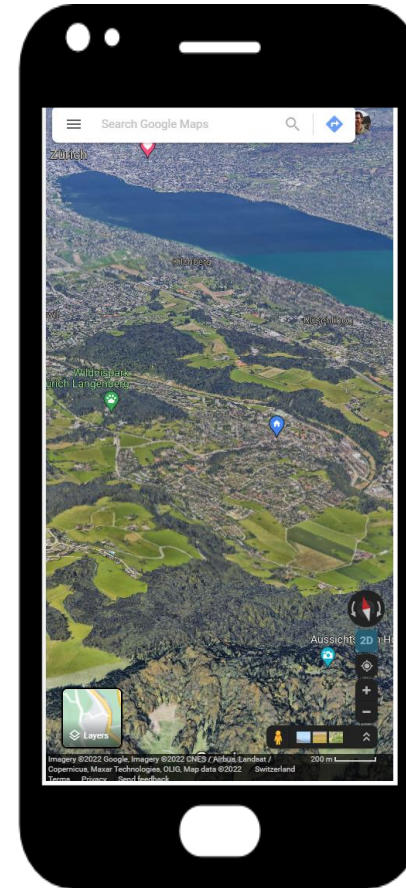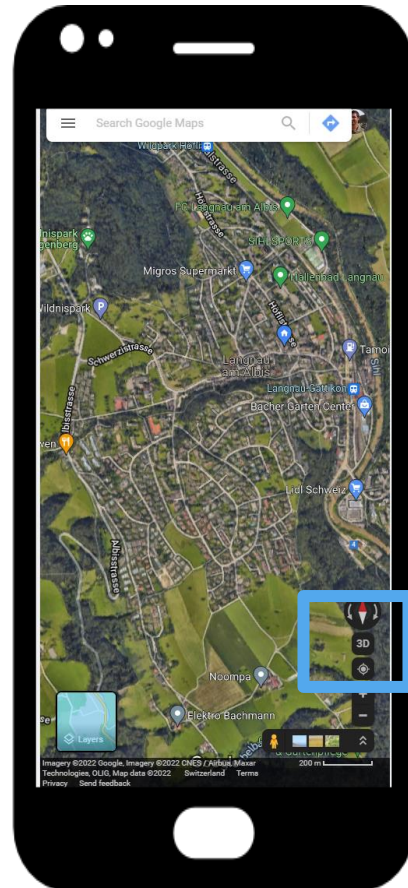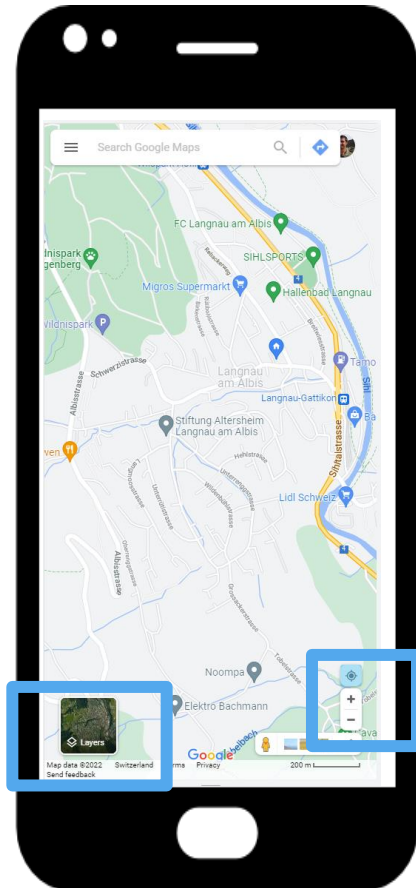| Overview Excursion | Field Work | Self-led Exploration |

passive-retentive ← → Learner's Level of Agency ← → active-creative
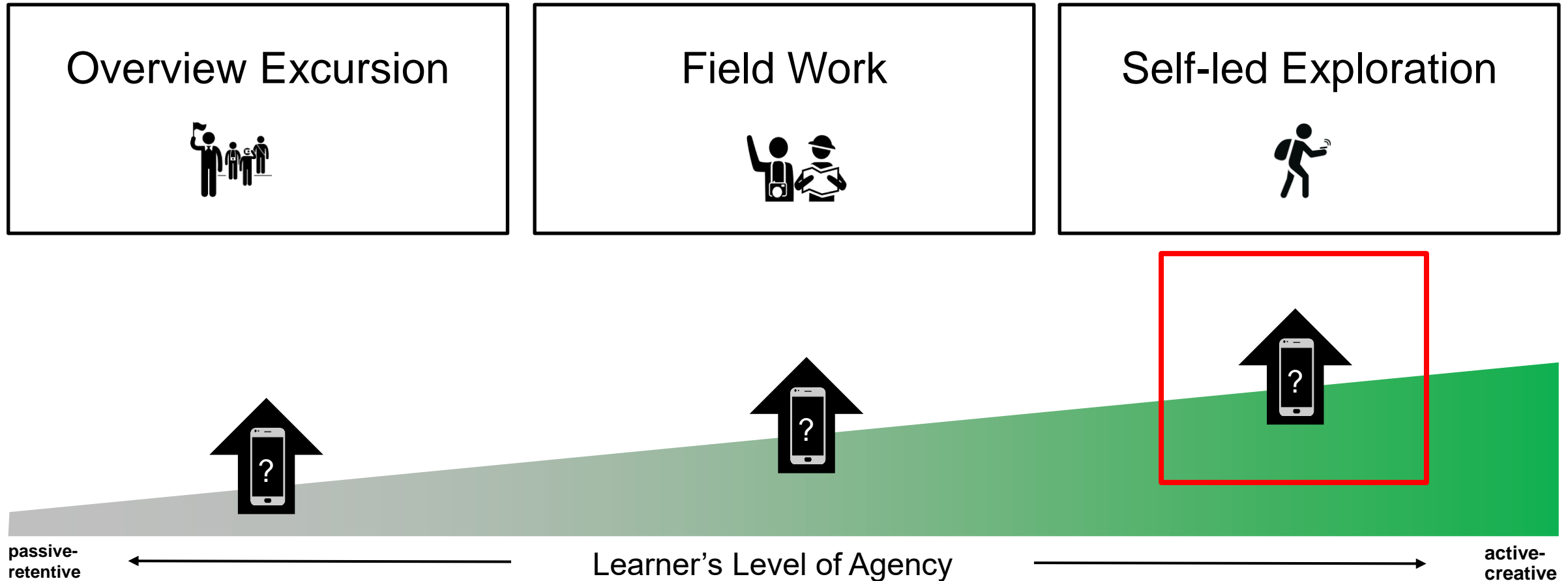
Google Maps / Earth
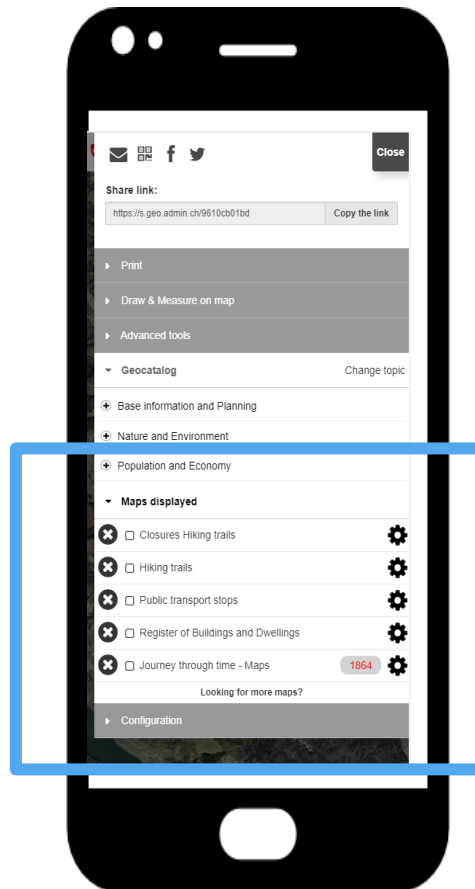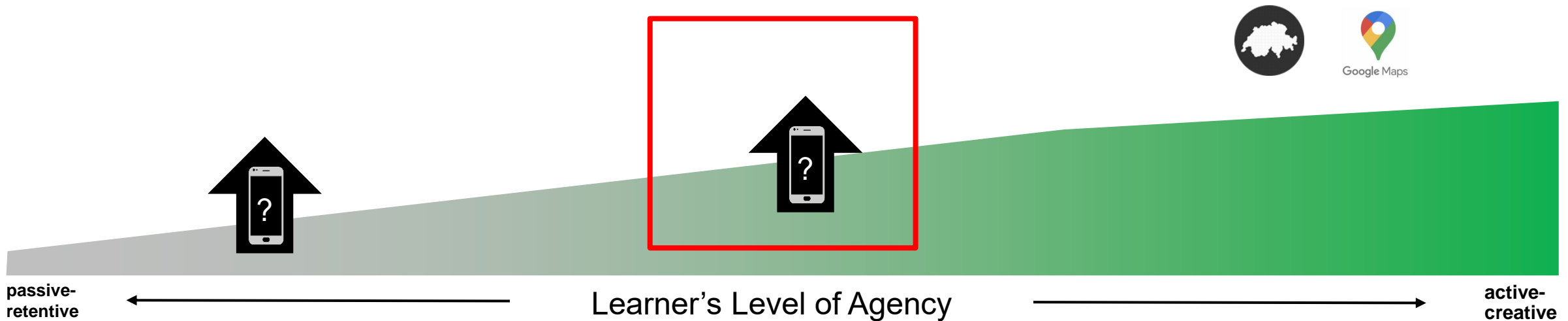

1 Locate Me

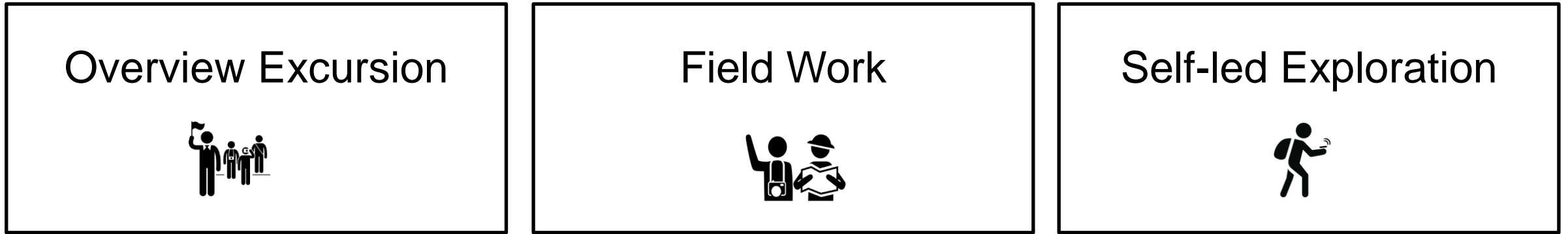2 Switch Basempas

3 Switch 2D/3D

https://map.geo.admin.ch
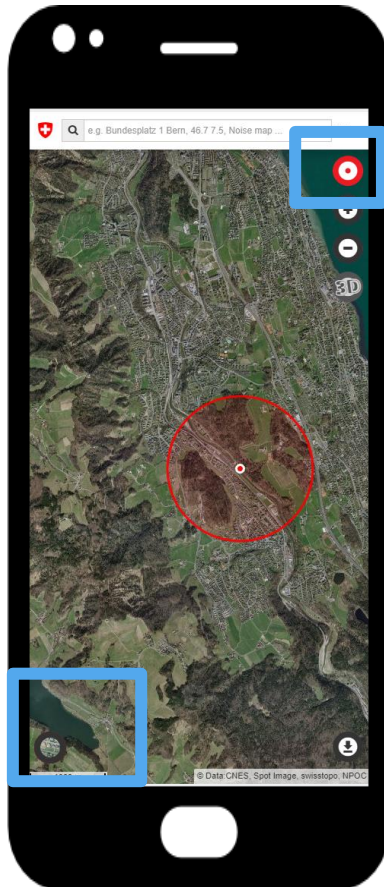
1 Locate Me

2 Switch Basempas

3 Add Topics as Overlays

Classification of the Field trip

Overview Excursion	Field Work	Self-led Exploration

passive-retentive

Learner's Level of Agency

active-creative
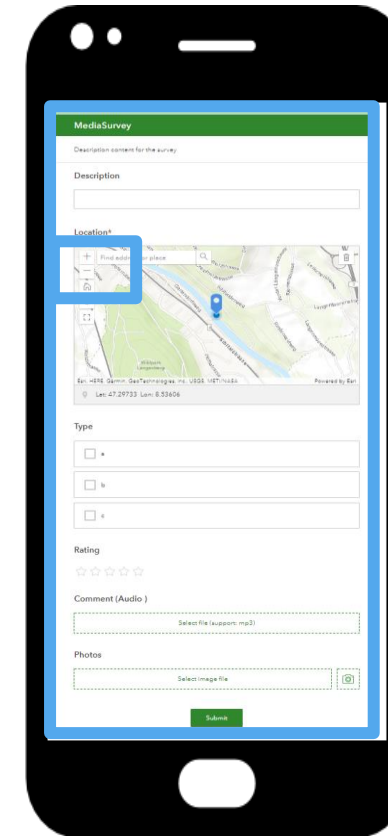
ArcGIS Field Maps
for collaborative field work

ArcGIS Survey123
for individual field work
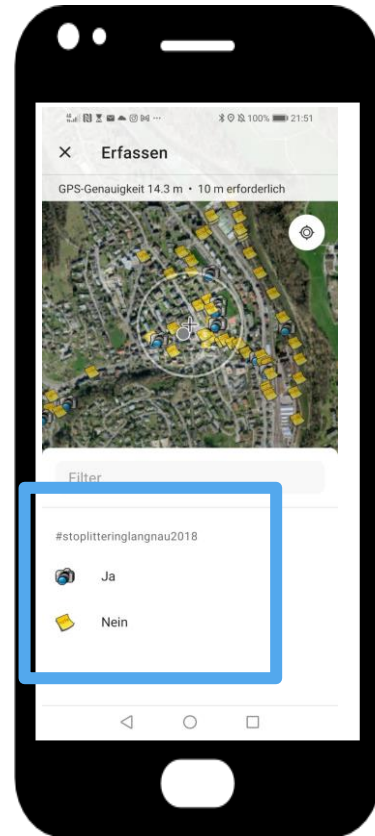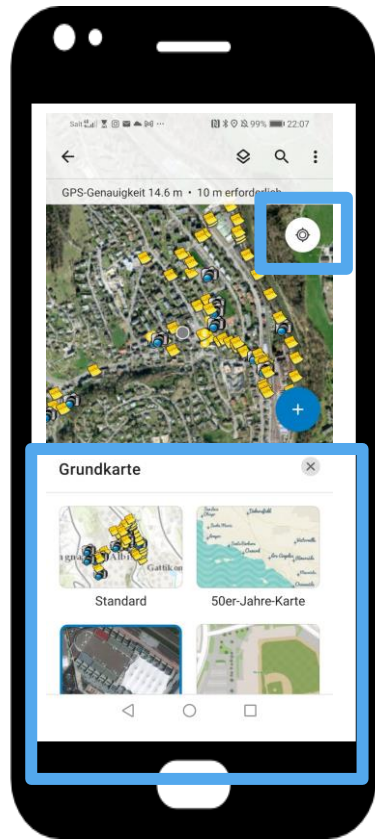
1 Locate Me

2 Switch Basemaps

3 Mapping the
collected data

1 Locate Me

2 Form-based
data collection

https://www.esri.com 1.1.2022

The Three steps of field work (trips)

Preparation

- **Teacher**: goals, interest
- **Learners**: pre-study (RQ), setup the technology, create the field work apps

Field Activity

- **Collect** data (text, photos, audio, video)
- **Share** experience via social media (chats)

Follow-up activity

- **Learners**: share experience, return to the content
- **Teacher**: eliminate misconceptions, ensuring decontextualization

Classification of the Field trip

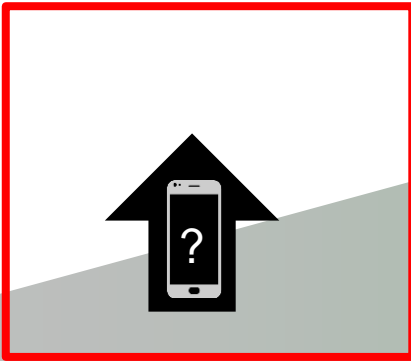| Overview Excursion | Field Work | Self-led Exploration |

Technology drives Learners' Agency

passive-retentive ← → Learner's Level of Agency ← → **active-creative**

Classification of the Field t

Overview Excursion

…to promote cognitive skills, health, well-being, and environmental awareness as well as **spatial orientation and spatial awareness for independent spatial navigation/guidance.**

This requires a map feature to visualize and sketch tasks as geofences!

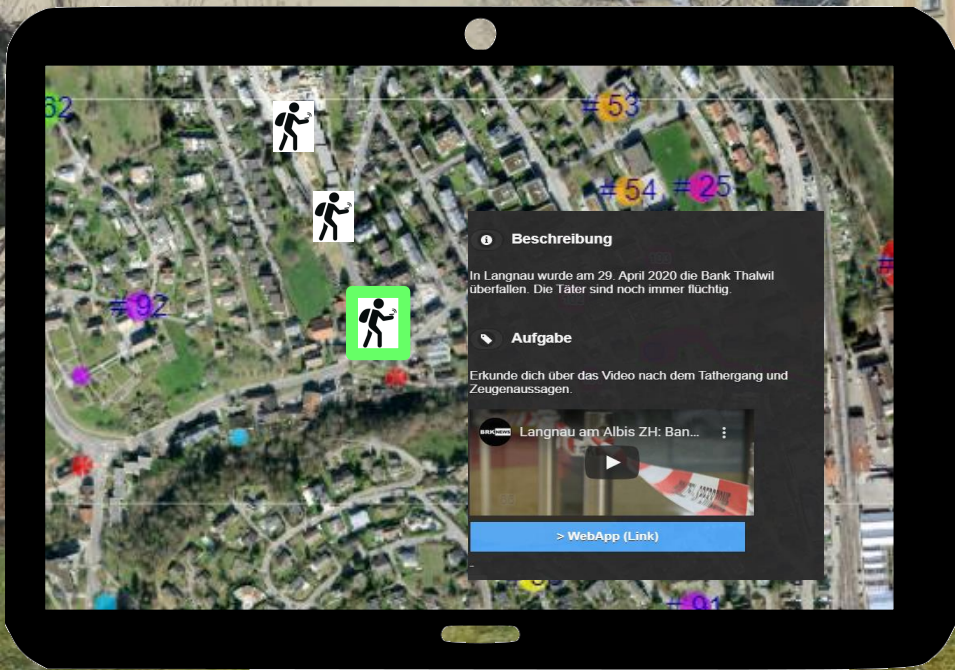Technology drives Learners' Agency

Self-guidance?

passive-retentive

Learner's Level of Agency

active-creative

Enhancing knowledge, skills, motivation and spatial reasoning

Beschreibung

In Langnau wurde am 29. April 2020 die Bank Thalwil überfallen. Die Täter sind noch immer flüchtig.

Aufgabe

Erkunde dich über das Video nach dem Tathergang und Zeugenaussagen.
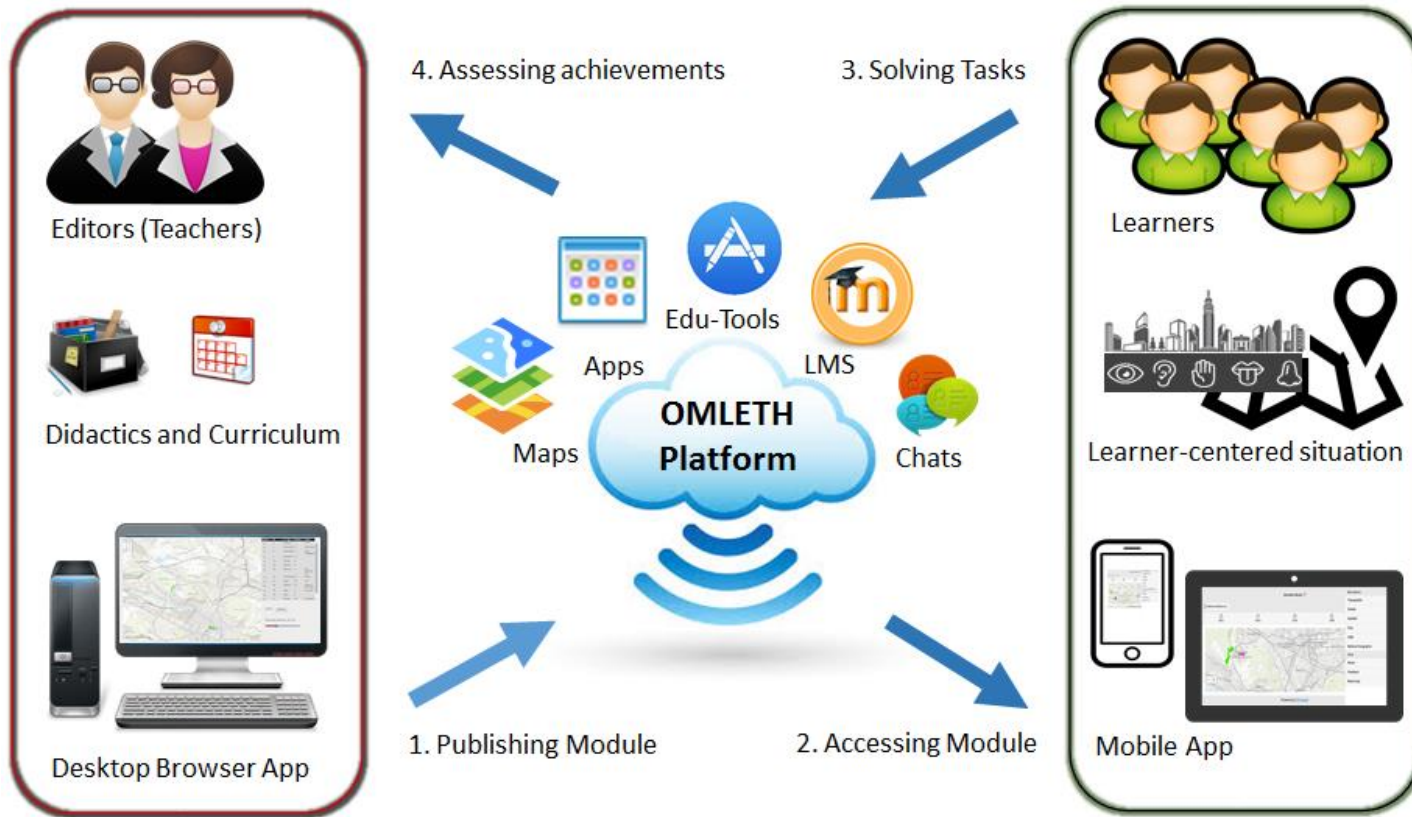
Langnau am Albis ZH: Ban...
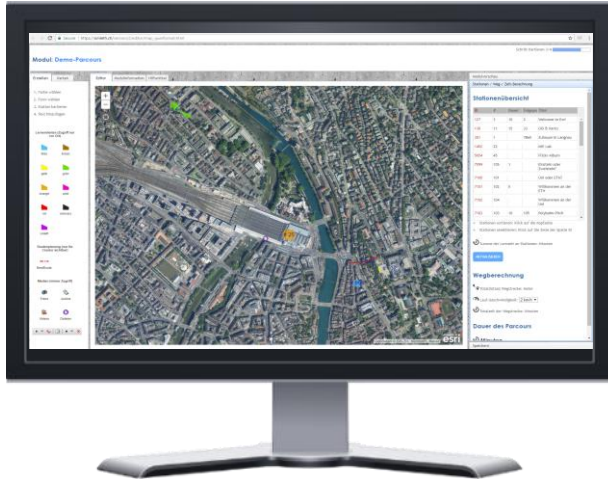
> WebApp (Link)

Location-based Mobile Learning

OMLETH*: An ETH Innovedum Project

The **development** and **evaluation** of a learning managment system for location-based mobile learning experiences at ETH.
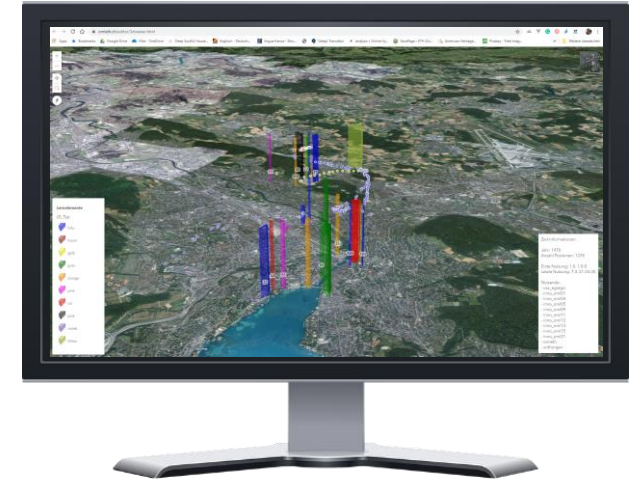
* Ortsbezogenes mobiles Lernen an der ETH

OMLETH's Webapps

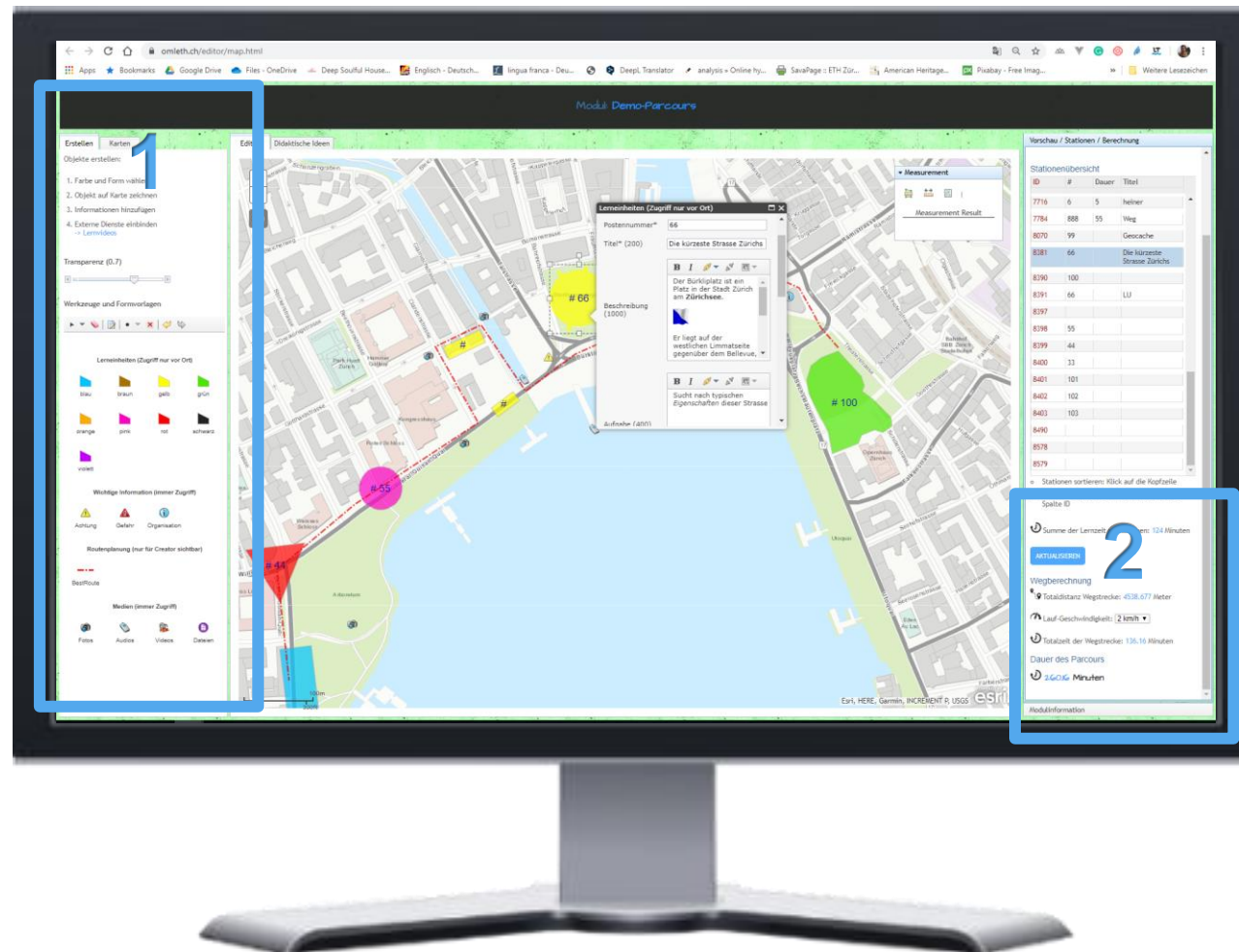
OMLETH – Creator

OMLETH – Player

OMLETH – Viewer

OMLETH - Creator

1 Editing Template

(Point and Polygons)

2 Route Planner
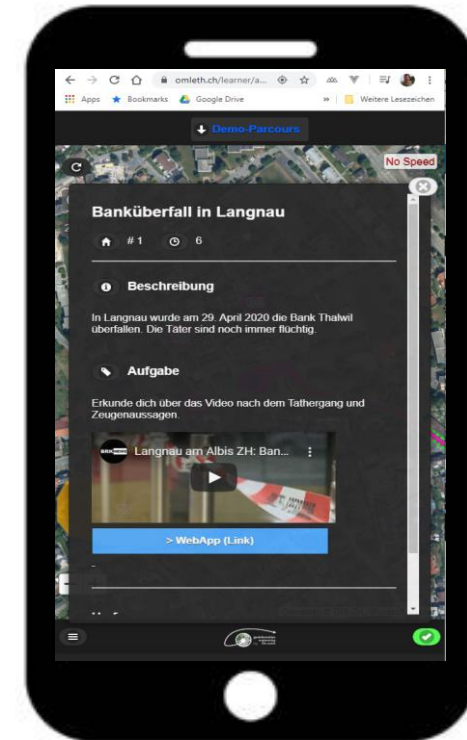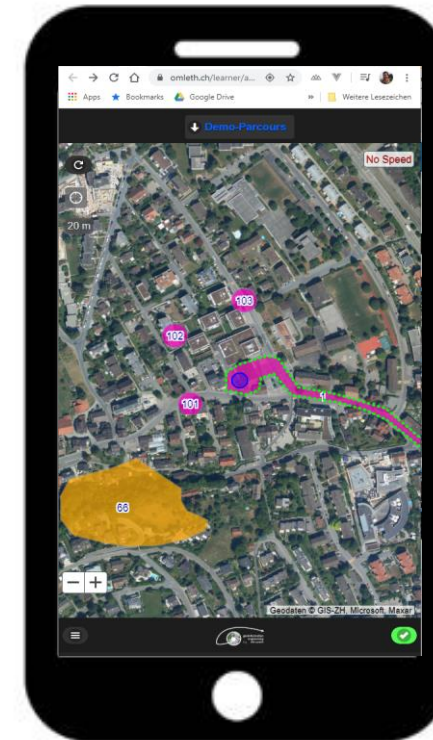
OMLETH - Player

1 Location controls

2 Learning station request button

3 Options (maps, informations, messenger)

OMLETH - Viewer

2D (Map, Table)

3D (Space-Time)

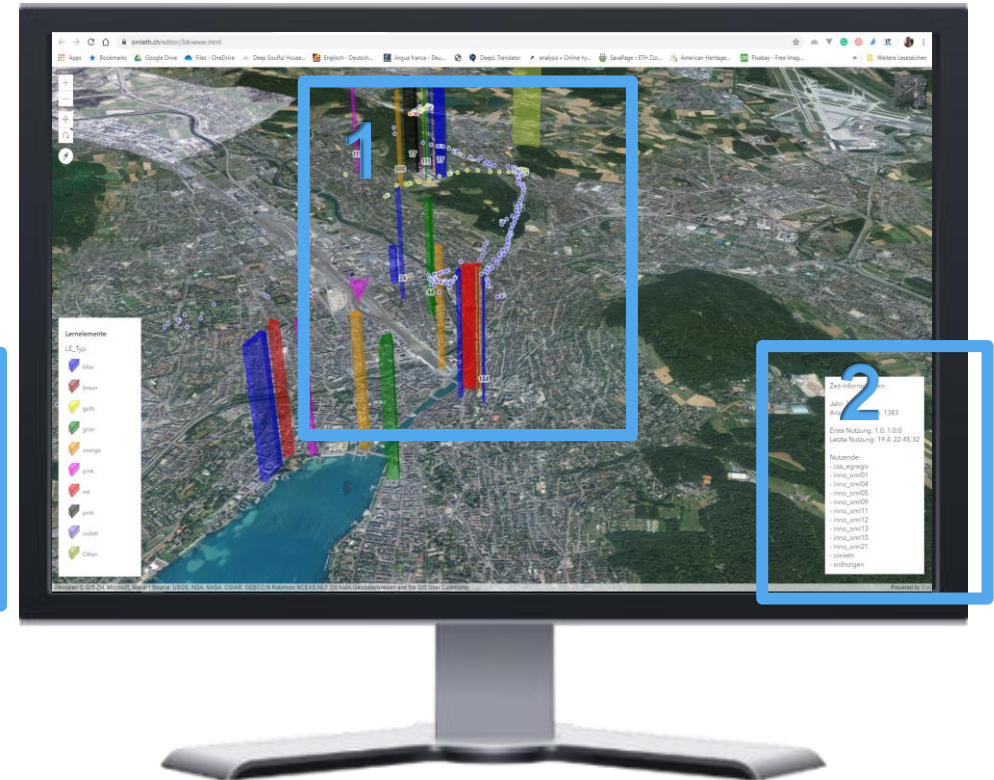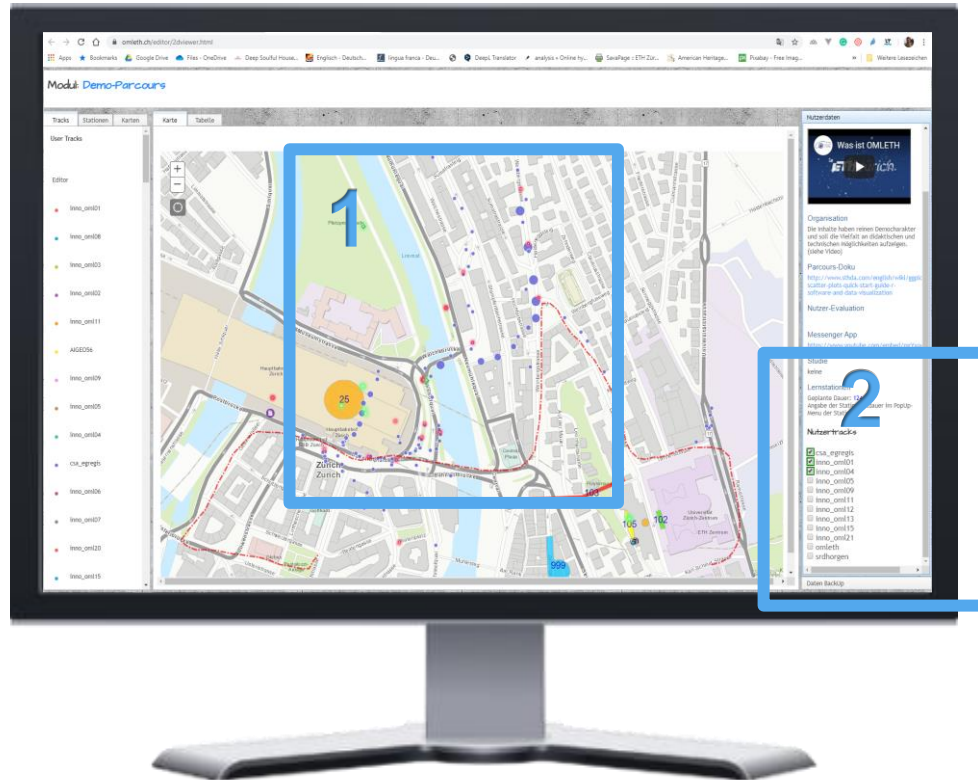1 Trajectories

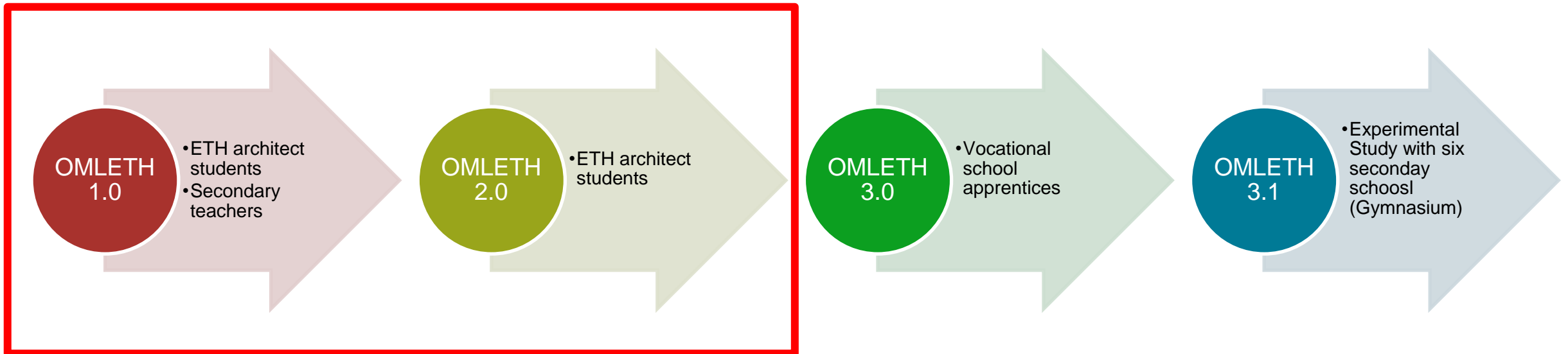(Speed, 8sec)

Station requests

2 Users

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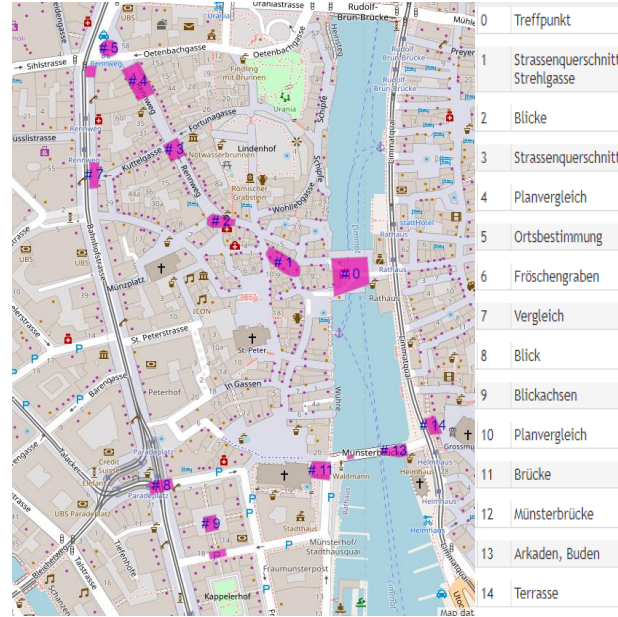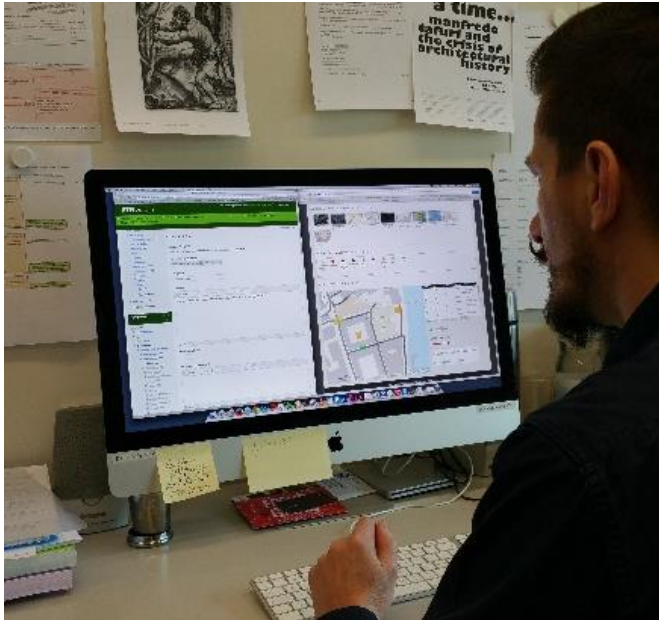
4. **Discussion**

Design-based research

Location-based Moodle learning modules
**Chair for the History of Urban Design (2015)**

OMLETH
1.0

Schito, J., **Sailer, C.,** & Kiefer, P. (2015). Bridging the gap between location-based games and teaching. In *AGILE 2015 Workshop on Geogames and Geoplay*. ETH Zürich.

Sailer, C., Schito, J., & Kiefer, P., & Raubal, M. (2015). Teachers matter: Challenges of using a location-based mobile learning platform. In *International Conference on Mobile and Contextual Learning*, 239-255. Springer, Cham
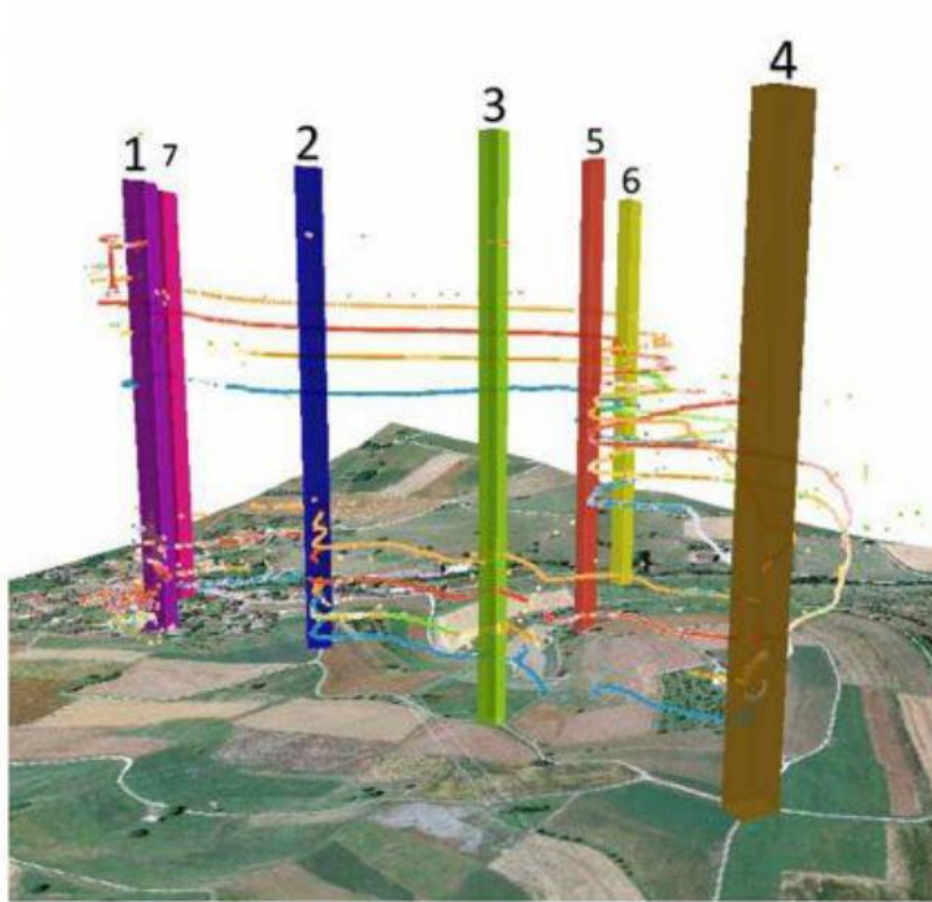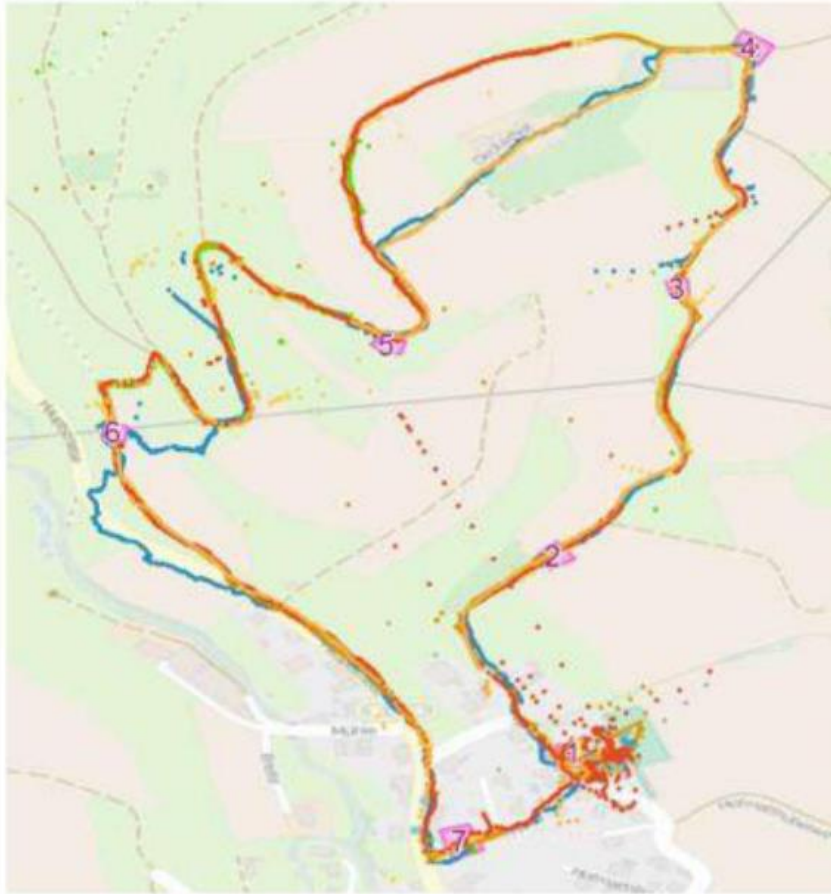
Design: Digital guided walk
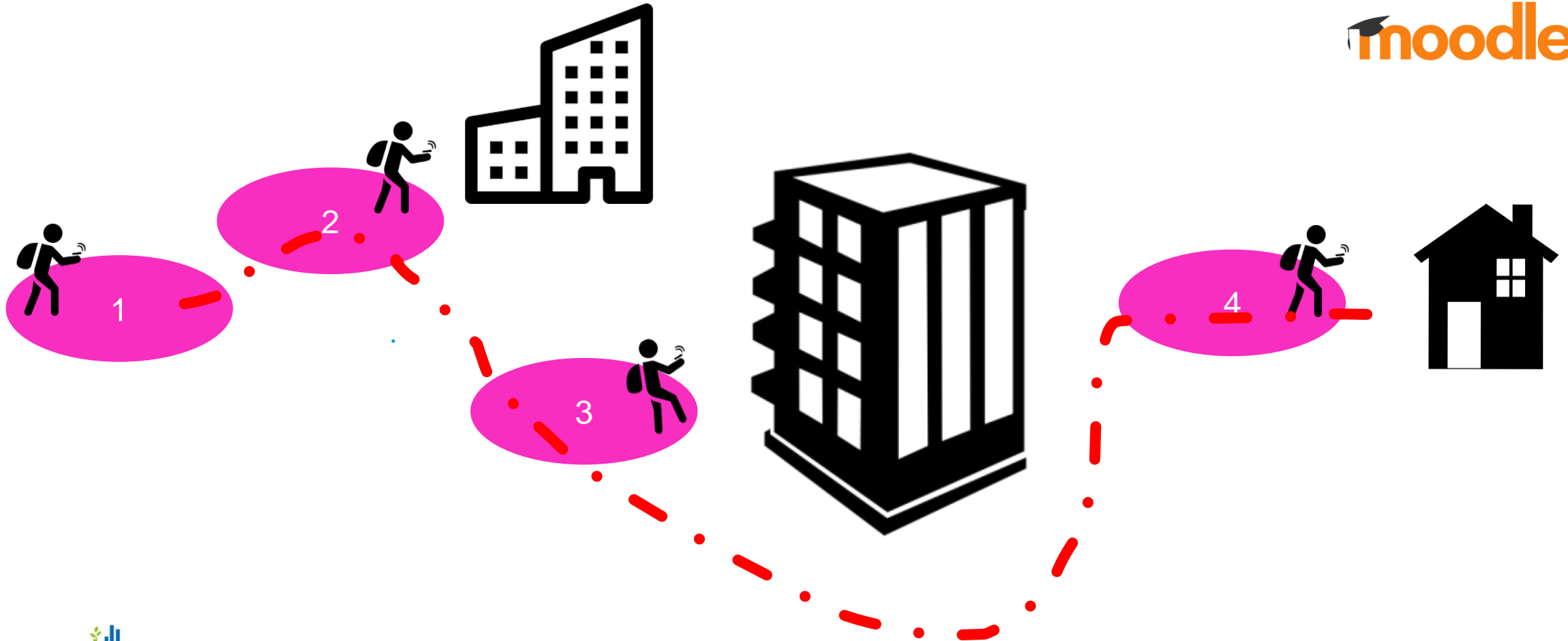
Map-based visual learning analytics
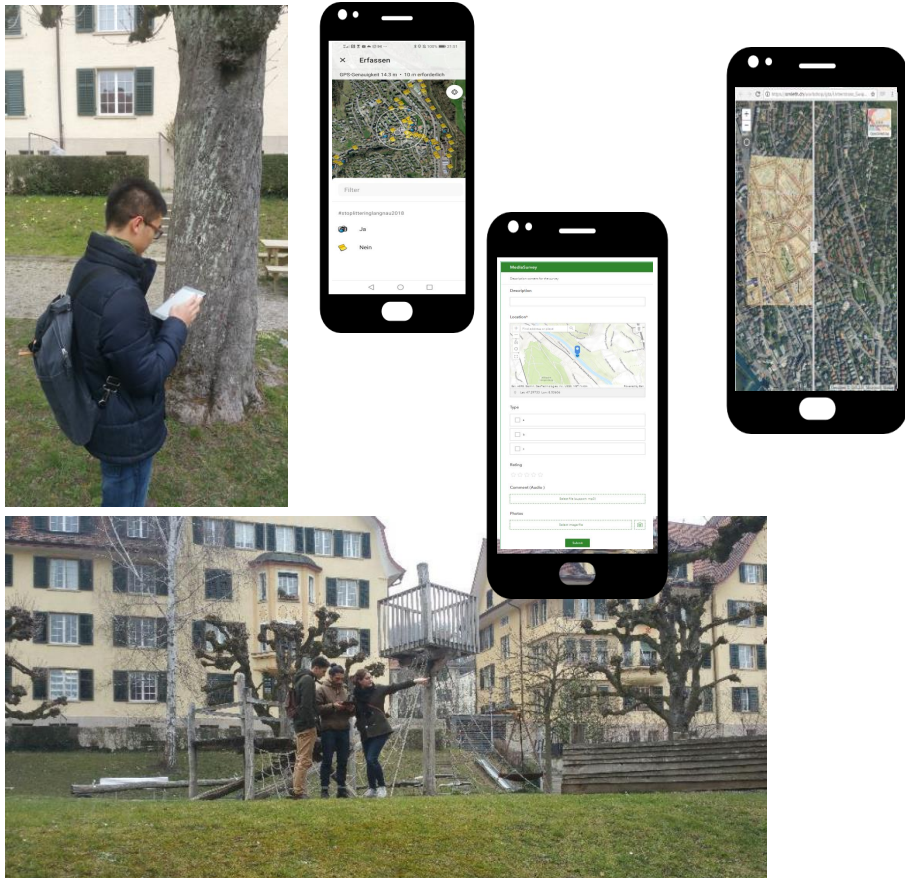## GeOlymp science camp (2015)

OMLETH
1.0

Sailer, C., Kiefer, P., Schito, J., & Raubal, M. (2015). *An evaluation method for location-based mobile learning based on spatio-temporal analysis of learner trajectories.* In Proceedings of the 17th International conference on human-computer interaction with mobile devices and services Adjunct, 1212-1218

Sailer, C., Kiefer, P., Schito, J., & Raubal, M. (2016). *Map-based visual analytics of moving learners.* International Journal of Mobile Human Computer Interaction (IJMHCI), 8(4), 1-28.
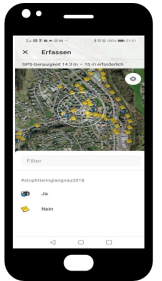
Inquiry-based teamwork modules
Chair for the History of Urban Design (2016)

OMLETH 2.0

Design: Data collection
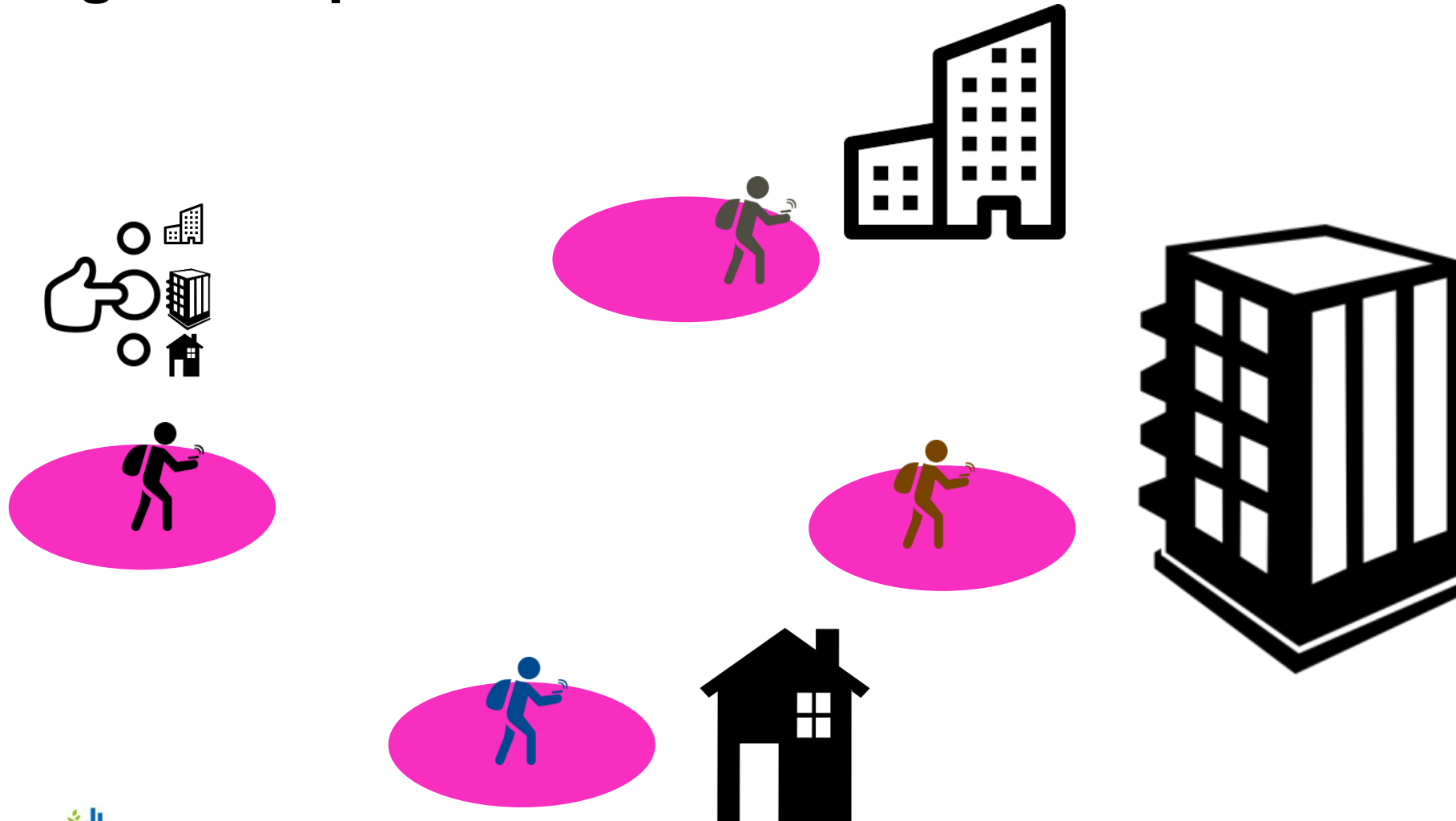

ArcGIS Field Maps

Design: Multiple Choice

Design: Multiple Perspective
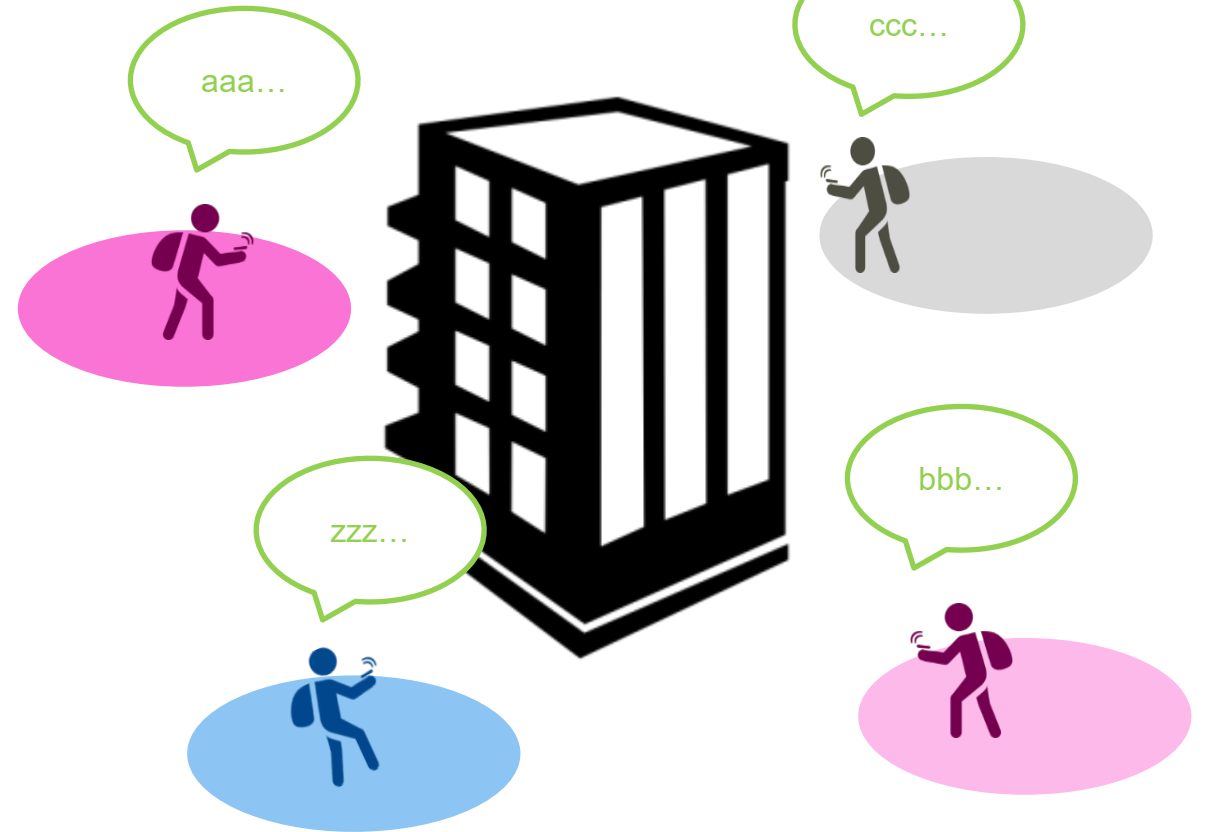
Classification of the Field trip
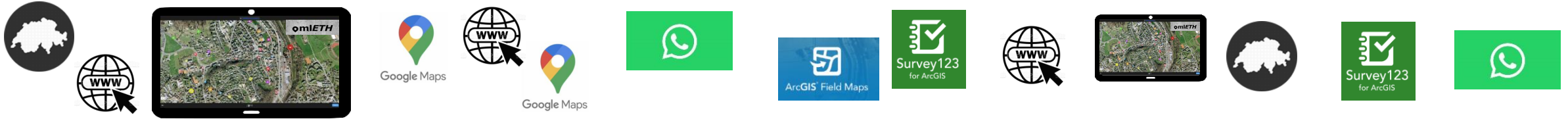
Technology drives Learners' Agency

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4. Discussion

Participants
(107 students, 6 teachers, 6 classes)

Beromünster
n=17
t=1

Zürich 2
n=11
t=2

Olten 2
n=18
t=1

Zürich 1
n=15
t=2

Olten 1
n=11
t=1

Aarau
n=35
t=2
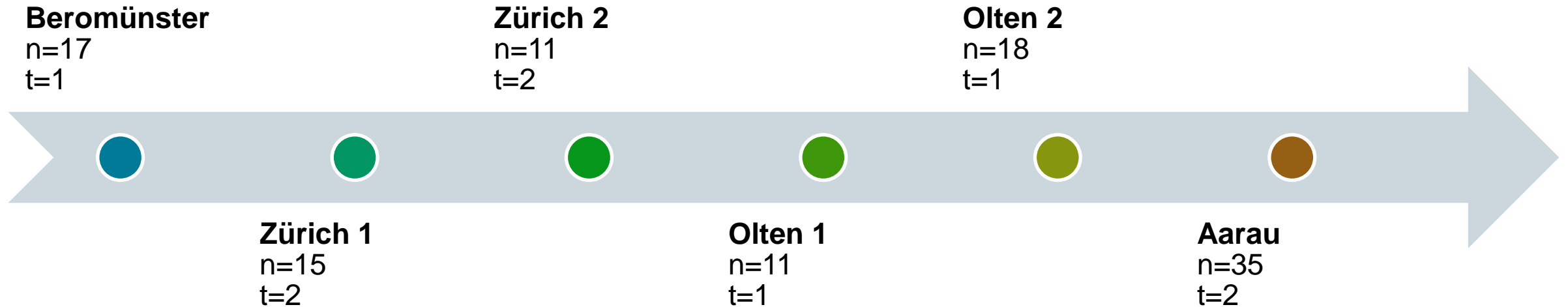
- ▪ n = number of students
- ▪ t = number of teachers

Methodology
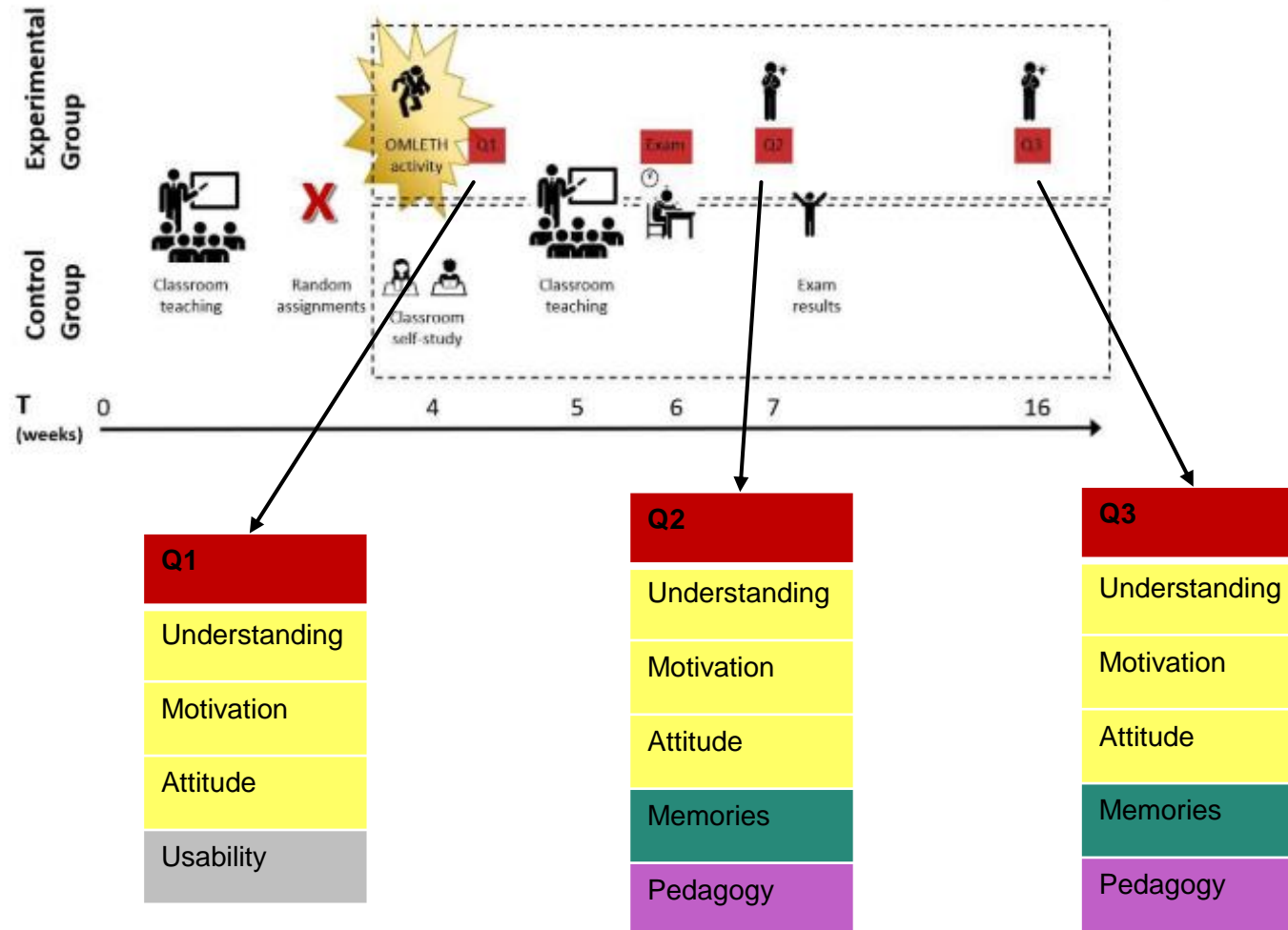
Examination: A location-based mobile learning lesson within a regular classroom teaching session will lead to **improved results in examination** outcomes

Experimental Group: 4.61 (n=56)

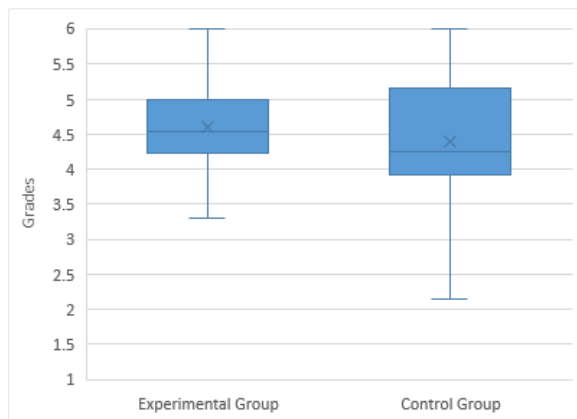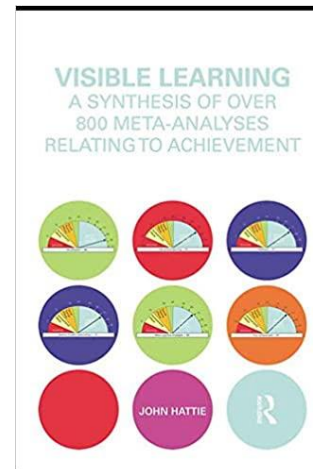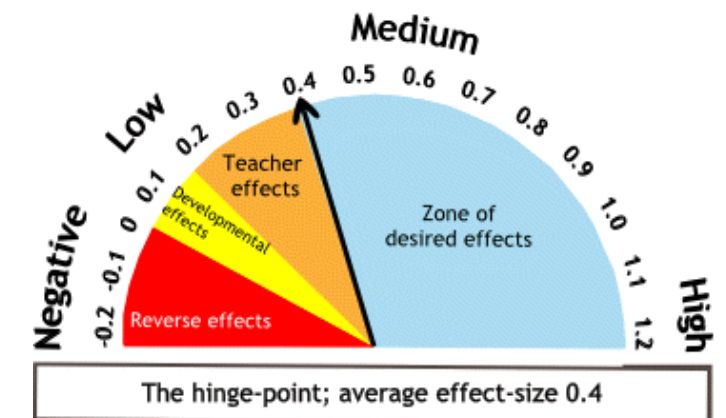Control Group: 4.3 (n=51)

OMLETH improves student's examination results (p<0.05, d = 0.38).

Mobile Learning: d = 0.37

Hattie (2015)

Self-assessment: Do learners who attended a location-based mobile learning lesson within a regular teaching unit demonstrate higher self-assessment, especially in cognitive ability?
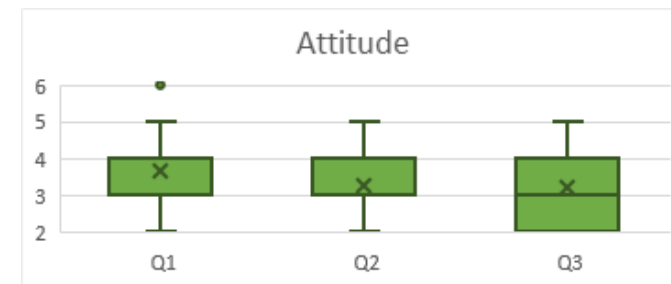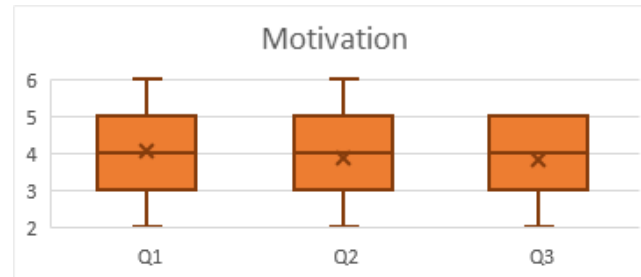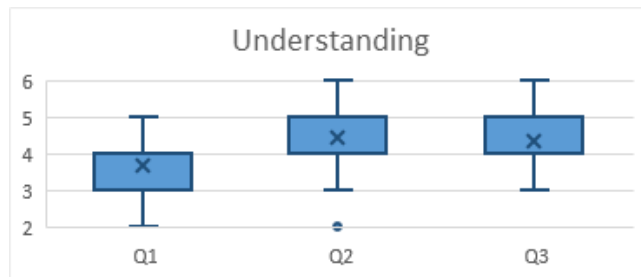
Time:
Q1: after the trail
Q2: after the examination
Q3: after three months

Answer options:
Agree Strongly (6)
Agree (5)
Agree Slightly (4)
Disagree (3)
Disagree Strongly (2)

Possible reasons for the improved **understanding** after Q1:
- learning at the debriefing
- learning for the examination
- learning on the examination

Memories: Do learners **remember the learning content** of the location-based mobile learning experience after the exam (Q2) / three months (Q3)?

Trail memories after examination (Q2)

Ebbinghaus' forgetting curve and review cycle

everything   a part of   nothing

Trail memories after three month (Q3)

Chun & Heo (2018)

everything   a part of   nothing
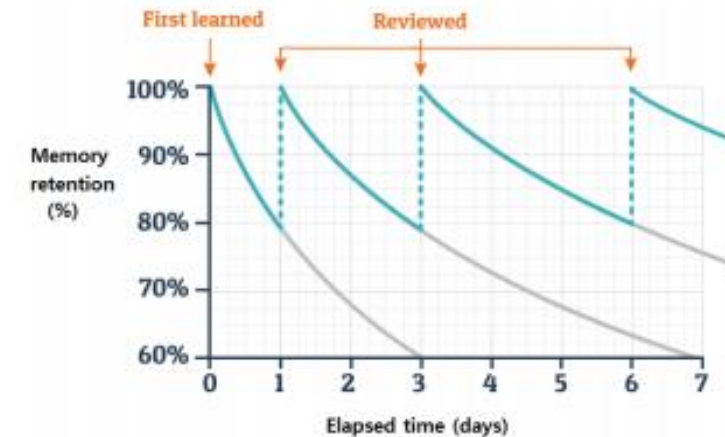
OMLETH field trips foster content retention.

Competencies
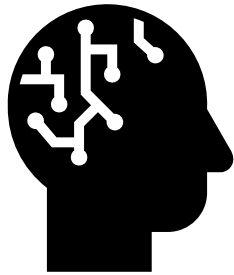
Knowledge, skills

- better examination performance
- ambiguous self-assessed long-term effects

Attitudes

- informal learning: 👍
- formal learning: 👍👎

Spatial reasoning

Creation of learning modules

Orientation in the field

Learning station task

Debriefing in the classroom

Personal learning environments

Publications

- **Sailer, C**., Kiefer, P., & Raubal, M. (2015). An Integrated Learning Management System for Location-Based Mobile Learning. International Association for Development of the Information Society.

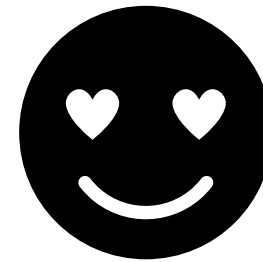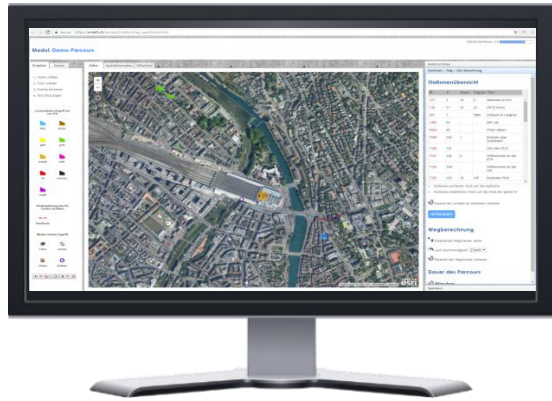- Schito, J., **Sailer, C.,** & Kiefer, P. (2015). Bridging the gap between location-based games and teaching. In *AGILE 2015 Workshop on Geogames and Geoplay*. ETH Zürich.

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- **Sailer, C**., Kiefer, P., Schito, J., & Raubal, M. (2015). An evaluation method for location-based mobile learning based on spatio-temporal analysis of learner trajectories. In Proceedings of the 17th International conference on human-computer Interaction with mobile devices and services Adjunct,1212-1218

- **Sailer, C**., Kiefer, P., Schito, J., & Raubal, M. (2016). Map-based visual analytics of moving learners. International Journal of Mobile Human Computer Interaction (IJMHCI), 8(4), 1-28.

- **Sailer**, C., Kiefer, P., & Raubal, M. (2018). OMLETH: A multimedia guide for field trips. ETH Learning and Teaching Journal, 1(1).

- Graf, A. B., **Sailer, C**., Jonietz, D., & Weibel, R. (2018). Towards Extracting Motivation from Mobile Learners' Movement Trajectories. In Adjunct Proceedings of the 14th International Conference on Location Based Services, 69-74. ETH Zurich.

- **Sailer, C.,** Martin, H., Gaia, L., & Raubal, M. (2019). Analyzing performance in Orienteering from movement trajectories and contextual information. In 15th International Conference on Location-Based Services (p. 141).

- **Sailer, C**., Rudi, D., Kurzhals, K., & Raubal, M. (2019). Towards Seamless Mobile Learning with Mixed Reality on Head-Mounted Displays. In World Conference on Mobile and Contextual Learning, 69- 76.

ETH *zürich*

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