Abstract

This paper presents an integrated course concept which offers students the opportunity to experiment with creative and knowledge-based approaches to a spatially enabled world. The learning setting is a student-led development of a geocaching and nature trail, bundling technical proficiency and geographic ‘storytelling’ with digital media into a new format for presenting and accessing geoinformation. Technically, core components are video-podcasts produced by students to communicate their stories of places along the trail. The video-podcasts are accessible by geopositioning devices and mobile tagging, i.e. a tag that links a geolocated position to a video-podcast via mobile internet. To this end, students work with a video camera, screencast and recording software and smartphones as spatially and internet enabled platforms for geopositioning and access to the video-podcasts via Quick Response (QR) codes. The geocaches are small plates with QR-codes to be discovered along the trail. The end product, an eGeo-Trüffel, is the combination of location, story and outdoor experience, bundled into a geographical perspective in a multimedia format. In terms of competences, students undergo a process of constructing their own eGeo-Trüffel through all steps from concept to draft and final production. This entails the development of media literacy through technology-enhanced learning. Collaboration, encouraging goal setting, joint problem finding and solving are characteristics of the learning experience. Social interaction and communication is important and the course structure helps to shape learning activities, and to sustain an interactive learning environment. Finally, the trail is presented to instructors, invited guests and the general public in a field presentation by the students. Hosted on the university multimedia platform, the nature and geocaching trail is supported and adopted by the City of Bochum and the Biological Station for the eastern Ruhr area, and this secures a long-lasting contribution to environmental education.

1 Introduction: Background and Motivation of the Project

eGeo-Trüffel is vision, concept and product of a teaching project carried out with Bachelor of Geography students. Alluding to places (the ‘Geo’ part) and ‘truffles’ (Trüffel in German) as rare and expensive food ingredient, the term implies what is distinctive and important about a place from a geographical perspective and is condensed into a description which puts understandings of social and biophysical processes within the context of a specific place. This relational view underscores the reciprocal relationships between physical entities and social categories. In analogy to the biology of truffles, which are symbiotic fungi that interact with plants to complete their life cycle, the eGeo-Trüffel comes into
existence as a synthesis of place and the meanings attached to it. Just like these fungi have become associated with a complex set of social understandings about delicacies, wealth, and food, natural things can have several cultural appraisals about utility and value. For example, in Earth Science terminology, any flow of groundwater emerging naturally from the solid surface of the earth is a spring. But whether or not nature conservation value or religious or medical meaning is attributed to a spring is dependent on place as well as social context. The ‘e’ in eGeo-Trüffel refers to the bundling of mobile devices, geopositioning services (GNSS, Global Navigation Satellite System), and multimedia to superimpose geoinformation onto the physical, real-time experience of localities.

The pedagogical motivation for setting up this learning with geoinformation project derives impetus from different, yet interrelated strands and discourses. The three main objectives of the learning project are related to (1) contextual/experiential and competence-based learning; (2) (critical) spatial thinking, and (3) (geo)media competence and literacy. Contextual/experiential learning as guiding principle means that the teaching and learning involves undergraduate Geography students in an interactive learning experience which entails much outdoor and field work, the use of evolving technologies and the application of disciplinary knowledge in a productive and creative way. This is in line with the now widely accepted pedagogical concept that learning becomes more effective when embedded into an appropriate context that enables learners to directly link concepts with their real world counterparts and put knowledge into action (compare WESTERA 2011). Empirical and conceptual research in geographic instruction science (didactics) has demonstrated and discussed the potential of geopositioning and geocaching as media and means for environmental education and the development of spatial abilities (GOSCHKOWSKI 2009, HARTL et al. 2006, ZECHA 2009). The eGeo-Trüffel course concept also sees GNSS and geocaching as means to engage students into critical spatial thinking, a concept which is not limited to, but within the course context mainly perceived as reasoning about places and space, about the students’ and instructors’ concepts of social and biophysical processes connected to specific places, and about media representation thereof (compare GOODCHILD & JANELLE 2010 and GRYL et al. 2010 for a comprehensive discussion of critical spatial thinking). The student target group is at a point on the learning curve where the curriculum is split up evenly between Physical and Human Geography, and Geomatics, but opens up to specialization by taking elective courses. This period of time seems ideal to explore geographical dialogue and the possibilities of connecting the social with the physical world before becoming ‘human’ or ‘physical’ or ‘geomatics’ geographers. The course participants are encouraged to deconstruct places and the landscape by exploring their different standpoints and by experiencing that two individuals never have exactly the same view of what they see. The study area as a physical place is setting the stage for descriptions of places and spatial patterns that ultimately have subjective and qualitative elements.

Conceptually, the eGeo-Trüffel learning project embraces the idea that geomedia foster the appropriation of space by contextualizing communication. The use of geomedia may support critical spatial thinking (GOODCHILD & JANELLE 2010), but equal importance should be attached to critical thinking regarding geomedia (GRYL et al. 2010). In addition, this learning project follows the argument that in order to make most of geomedia, students should be supported in developing media competence and literacy, enabling them to keep pace with the continuously emerging dimensions of context brought about by increasing power and accessibility of tools for imaging (virtual) spaces (GOODCHILD & JANELLE 2010, WESTERA 2011). The increasing pervasiveness of technology and access to it does not
necessarily transfer to learning, nor imply that technology is always used to its best advantage. In this respect, GOODCHILD & JANELLE (2010) point to the widening gap between the power and accessibility of tools for imaging (virtual) spaces and the ability to make effective use of it for in-depth understanding. Media competence and literacy are complementary teaching and learning objectives to (critical) spatial thinking. Consequently, the third objective of the course concept is directly related to challenges posed by the changing nature of learning context. Continuously emerging digital media keep adding new dimensions to learning context, yet instructional practice is lagging behind this development. The challenges posed to teachers and education designers are shifting from the creation of appropriate learning contexts to the task of coming to grips with contexts that are increasingly induced by the learners themselves, depending on the media they use, and the conditions for learning they create themselves (compare WESTERA 2011, p. 203).

The eGeo-Trüffel project connects digital media, internet, and spatially enabled mobile devices to the context of learning, disciplinary knowledge, and emerging new learning environments by engaging students in the complex task of expressing a geographical perspective in a multimedia format. This model of learning is both process-oriented and goal-oriented. Students train and learn new methods by applying them. Through video-podcast production, students bring their knowledge, skills and abilities to bear on new and different tasks. Students carry disciplinary knowledge with them, add and construct knowledge about the study area to their mental model and communicate it in a different context and format, a setting which supports the development of students’ geoinformation competence and problem solving skills. By doing this, students enhance their media competence and literacy. Being media literate implies an understanding that mediated representations always produce a truncated or enriched view of the world. Media literacy competences involve active questioning and examination of assumptions, techniques, and data – comparable to the criteria for an involvement of the mind as defined in the context of critical spatial thinking (GOODCHILD & JANELLE 2010). In the eGeo-Trüffel project, the role of the instructor and the tutor is to help the learners in aggregating information and in understanding the media and the way they represent (geo)information.

2 Conceptual Design and Implementation of the Course Scheme

Students explore spatial relationships in an area of great landscape value – as manifested by its status as nature reserve and highly frequented recreational area – subsequently select a range of topics of their own choice and produce video-podcasts that are ultimately integrated into a geocaching and nature trail in Bochum City, northwestern Germany.

2.1 Central teaching and learning objectives and approaches

The first run of the course in 2010 was realised with ‘analogue’ media and the students presented the Geo-Trüffel as print-outs of illustrated short texts. This paper describes the advanced course concept which is geared to take learning and spatial thinking on to ubiquitous spatially enabled mobile platforms. Important is and the objectives are, however, not the production of a ‘shiny’ interface or technically ‘perfect’ video-podcast, but rather the
conceptual approach the students are taking to realize their eGeo-Trüffel. As users of spatially enabled platforms such as smartphones and consumers of a wide array of multimedia content in the context of entertainment and learning, the students can bring their own approach to bear on the task of presenting a site from a geographical perspective. In this process, students practise critical spatial reasoning by reflecting qualitative attributes of place, the space-time perspective, and the contextualisation of communication through applications of mobile tagging and geoinformation technologies with spatially enabled devices. This approach to nature trail and geocaching design is new and goes against the grain of established perspectives. Conventionally, nature trails are categorised by their focus on scale, topic or time-space aspect, and their conception mostly follows a hierarchical and disciplinary knowledge system approach (EDER & ARNBERGER 2007). This equally applies to geocaching with its added treasure hunt component (SADEWASSER 2007). In contrast to nature trails supported by leaflets or interpretation boards, the eGeo-Trüfl train is not directional but rather invites the user to augment the location-based experience by a digitally delivered narrative. In contrast to geocaching, the user is not taking some treasure in or out of the cache; the mediated and virtually extended location-based experience is the treasure and the cache. To comply more with the give and take philosophy of geocaching, future versions of the eGeo-Trüffel concept could be extended to an interactive Web 2.0/Geo Web setting by opening it up to third-party volunteered geoinformation and contributions of location and descriptive data. The course not only focuses on the end product, although the setting is project-based and this has proven to be very appealing to students, inducing intrinsic motivation. The teaching and learning focus is equally on place as an important contextual framework for spatial thinking. Students are encouraged to create each eGeo-Trüffel with the aim to support people in learning about the place through direct experience and multimedia visualisations. Students must try to explain the context to non-experts. To this end, the students go through (re-)constructing their knowledge and go through making this process overt by experiencing knowledge construction and its combined application with skills and attitudes within real world contexts. Following GOODCHILD & JANELLE (2010, p. 9), the course context defines critical spatial thinking in relation to the use of spatial tools and data which implies that “the processes of data manipulation, analysis, data mining, and modelling provoke and require critical thinking, about such comparatively profound issues as scale, accuracy, uncertainty, ontology, representation, complexity, projection, and ethics.”

2.2 Curricular integration and framework for the course concept

The course ‘eGeo-Trüffel – Nature Geocaching meets eLearning’ is embedded in the 3-year ‘Bachelor in Geography’ programme at the Geography Department at the Ruhr University Bochum, Germany. The course is an elective usually taken by Bachelor of Science and Bachelor of Arts Geography students in their second or third year. Tailored to a group size of 15 to 20 students, the course equates to 6 ECTS credit points or 180 hours work effort.

2.3 Modes of teaching and learning

The course combines instructor-led sessions, field visits and field work, input from external experts and project work, including product-orientation, to create a unique learning experience. The course structure helps to shape learning activities and to sustain an interactive learning environment (Figure 1). Before the course starts, the instructors select a suitable
area, including the identification and labelling of a range of potential sites and topics. This pre-selection is helpful to the students as it provides some guidance in a complex and unconventional learning setting. Even more important is the first stimulus through some example material (video-podcast) that shows how disciplinary knowledge can be used in a productive and creative way to inform non-experts about a place, for example a seemingly unappealing wet meadow. After teaching input by lecturers and external experts, reading and other preparatory work, students and instructors visit the sites preselected by the student groups themselves. In the field, the students’ ideas on what kind of geographical story is behind the site and how this story can be produced is discussed. The next project milestone is the presentation of a draft concept for the eGeo-Trüffel, followed by the production phase which starts in week 10 to be continued through the end of week 13 when the final eGeo-Trüffel are presented and assessed (Figure 1). After this, the entire team is engaged in the test run for the public opening of the nature and geocaching trail. The final project milestone is the presentation of the course results by presenting the eGeo-Trüffel nature and geocaching trail to invited faculty and the general public at the start of the next summer term (Figure 1). It is important to stress that the instructors and tutor do not interfere with or hinder the realisation of an idea but restrict themselves to discussion, feedback and providing additional information from their academic background and disciplinary knowledge in the field of Geography. In this way, the students are encouraged to reflect upon the various facets of information available to them and to reflect upon the way such information is communicated in standard textbooks, field guides et cetera. The final topics that were chosen, redefined and refined by the students show this process of ‘placemaking’ in the thematic context of the nature and geocaching trail (Table 1).

Table 1: Topics chosen, redefined and refined by the students for their eGeo-Trüffel

<table>
<thead>
<tr>
<th>Group</th>
<th>Student selection of topics for eGeo-Trüffel realisation</th>
<th>Original topics – instructors’ stimulus</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Origin and ecology of ponds in the area; reed beds as habitat; mill stream and human usage</td>
<td>“Tippelsberg” – a construction rubble hill; Allotment gardens; Alluvial gravel deposits from the ice age; Beech forest; Bridge; Dead wood; Edge of the forest; Field; Giant horsetail; Half-timbered house; Information board; Landscape and vista (northwest, east and south); Loess defile; Manicured green; Mill pond; Natural succession; Nature on the motorway; Path in the forest; Pond; Reed bed; Surface water renaturalisation, Tall forb communities; Wall; Wet meadows and social fallow</td>
</tr>
<tr>
<td>2</td>
<td>Giant horsetail (<em>Equisetum telmateia</em>); alluvial forest; beech forest and V-shaped valley, mill pond and mill</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Tippelsberg (genesis, legends, local recreation, vista), natural succession and non-native species; vista Emscher valley; Ruhr area (forested area, land use, structural change and future socio-economic prospects)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Geology of the Ruhr and Emscher valley; land use; wet meadows and social fallow; loess defile</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Introduction to the nature and geocaching trail</td>
<td></td>
</tr>
</tbody>
</table>
Fig. 1: Project plan for the course concept including role- and task-oriented description of teaching and learning content. The course structure and its chronology help to shape learning activities and to sustain an interactive learning environment.
In line with the principles of contextual and experiential learning, student activity and team-based learning are quantitatively and qualitatively major components of course work (Figure 1). The amount of formal instruction is comparatively small and the main role of the instructors and the tutor is support and guidance throughout the practical phase of the eGeo-Trüffel production. The assessment scheme takes performance into consideration, i.e. how well the task has been solved according to a set of criteria. Most important are the following criteria: conceptual approach taken (descriptive, creative, innovative, dimensionality), presentation and interlinkage of factual information in the video-podcast, design, layout, appropriate language, approach and complexity of the riddle to be solved by the geocachers to exactly locate and find the eGeo-Trüffel plate with QR-code (geocache).

The teaching and tutoring delivery comprises (compare Figure 1 for the chronological order and the predominant mode of instruction of the course elements):

- One lecture session where instructors present the course concept, introduce GNSS and geocaching theory, and where time scheduling within groups, with the instructor and tutor is worked out in a collective effort
- One field excursion with the whole group to the study area with hands-on practicing of geopositioning functionality with mobile devices and detection of a sample geocache
- One lecture session with a focus on technical topics that combines software demonstration, lecturing on the basics of film making by an external media expert (tv.rub.de), and discussion about a sample video-podcast to provide ‘how to …’ guidance
- Hands-on tutor support for each individual group during the production phase

The assessment comprises:

- Assignment 1: presentation of concept, including literature/media overview relevant to the topic of the individual eGeo-Trüffel (3 to 4 must be realised per group); worth 15%, due in week 8; students get feedback by instructors and group
- Assignment 2: presentation of final video-podcasts; worth 50%, due in week 13
- Assignment 3: a project report on conceptual, technical and implementation aspects, including a film script and the description of tasks and responsibilities as well as project milestones; worth 20%, due in week 13
- Assignment 4: final on-site presentation of the geocaching nature trail that connects all eGeo-Trüffel; in addition to the instructors and invited faculty from the Geography Department, the audience is the general public, the event is advertised accordingly: on the departmental homepage, with flyers and brochures; worth 15%, due in week 24 at the start of the next summer term (in April)

3 Technical Realisation

3.1 Technical equipment for eGeo-Trüffel production and hosting

University eLearning infrastructure is the technical backbone for providing access to the eGeo-Trüffel nature trail. Ultimately, the complete trail will be hosted at the RUBcast Server, the central platform for multimedia eLearning content at Ruhr University Bochum (RUB). Recently, the RUB-App ‘RUB mobile’ was launched by the university’s elearning facility in autumn 2011. RUB mobile is free of charge, available for iPhone/iPod touch
operating system (OS) 3.1.3+ and Android OS 1.5+, and provides easy and fast access to information at RUB. The nature and geocaching trail is accessible by the RUB mobile App.

Each student group has access to a camcorder, memory cards, camera stands, headsets and screen capture and recording software providing professional tools for creating the video-podcasts. Two smartphones with Android OS and internet flatrate are available to the students as devices for testing the video-podcasts and QR-codes with.

### 3.2 Bundling mobile tagging, geoinformation, geocaching, and nature trail

In general, mobile tagging is the process of providing data read from tags for display on mobile devices. In the course context, mobile tagging is the interface between geolocated position and mobile internet to access the multimedia eGeo-Trüffel content (Fig. 2). Mobile tagging is a sequence of pointing the mobile (phone) camera on a two-dimensional barcode (tag) which is read by taking a picture, then decoded in the internet enabled mobile device to address and access information through internet. The quick response code technology applied is among the 2D Barcode technologies most widely used. Next to x and y-coordinates for geopositioning, the use of QR-codes seemed the best way of contributing learning content produced by students to the emerging learning context of the Geo Web induced by new technologies.

![QR Code Image](image-url)

**Fig. 2:** Design of the geocaching plates which are used for mobile tagging along the nature and geocaching trail. The tags are fixed to signposts, trees or other static objects. The Quick-Response Code (2D-barcode) addresses and accesses the eGeo-Trüffel. Please use this QR-code to watch the introductory video-podcast on the nature and geocaching trail described in this paper! Alternatively, go to [http://bit.ly/ygkij8](http://bit.ly/ygkij8) with your web browser. The video format is adjusted to mobile devices.

### 4 Student Feedback and Lessons Learnt

Student feedback was collected with an evaluation questionnaire that included seven scaled questions on the learning setting and outcome. The overwhelming majority (93%) of the respondents (n=16) rated the learning arrangement as innovative and liked the creative work character and video-podcast production. Two thirds of the students felt that the course
related digital media to Geography as discipline, and 81% were motivated by the overall goal to develop a nature and geocaching trail for the general public. Most respondents (75%) fully experienced the learning setting as supportive and encouraging in terms of own initiative and self-organisation, while 25% gave the second-best vote on this statement. Responses to open questions showed that students enjoyed carrying responsibility for their own video-podcast, including time and group management. Students appreciated a free course atmosphere that had room for own ideas, creativity and independent time scheduling. Work with digital media and to ‘see things through Geography-coloured glasses’ were rated particularly positive. In addition, respondents emphasised that the outlook to make the video-podcasts available to the general public at the end of the day demanded a great deal of high grade work of them and pushed them to try their best.

One of the exciting outcomes of the course and eGeo-Trüffel project is that all participants make the novel experience that QR-codes, which are ubiquitously encountered in the mediated world, can be effectively used for the appropriation of space and collaborative knowledge production. Students get an idea about how such geomedia could support the agency of prosumers (the crossover of consumer and producer) in counter-mapping or other ways of producing alternative representations of the world. This is a welcome side-effect of the course, and may support learners in emancipatory uses of geoinformation (see GRYL et al. 2010). However, the quantitative evaluation of student feedback in the pilot phase is not a representative sample and conclusions about successful encouragement or stimulation of critical thinking cannot be drawn from it. The inclusion of more contentious topics might also better spark critical thinking regarding geomedia than it was the case with the predominantly physical-geographical eGéo-Trüffel topics in the pilot phase (Table 1).

5 Conclusions and Outlook

The course concept is a practical and emancipatory GI-based learning environment. Instead of mainly technical competences and a focus on maps or other conventional geomedia like profiles, models or graphs for translating and communicating social and physical space, students break down the area and sites proposed by the instructors’ stimulus (Table 1) recursively into places, thereby reflecting the spatial representations they are receiving through a variety of media. By narrating and producing their eGeo-Trüffel, the students communicate amongst each other and with the instructors about the intentionality of the use of terminology, perspectives, camera angle, voice-over, text etc. in the video-podcasts to convey their story. Some of the competences identified as essential to spatial citizenship (GRYL et al. 2010) and critical spatial thinking (GOODCHILD & JANELLE 2010) are supported by this learning setting. While the metasetting has been a nature trail and the geocaching is connected back to themes mainly from, but not limited to, Physical Geography (Table 1), the students experience disciplinary discourse by doing their own geographies of eGeo-Trüffel. Most important in this respect is the reflection about how environmental factors and human appropriation of space are interrelated and how this changes over time – this point is exemplified by the study area chosen. In principle, however, the course concept could be extended to many more learning scenarios, for example in role plays and case studies that broach the issue of environmental conflict in wind or solar power installation, airport extension, road construction or site selection for nuclear waste repository. Concluding, the course concept described in this paper demonstrates learning and teaching with
geoinformation that is inspired by theoretical approaches to (critical) spatial thinking and citizenship – and that embraces emerging digital geomedia in the context of higher education.

Acknowledgements

Our project ‘eGeo-Trüffel – Nature Geocaching Meets eLearning’ is one of the winners of last year’s RUBel 5x5000 award and received 4,000 Euro funding (http://www.rubel.rub.de/5x5000). We also thank the RUBcast team for hosting the video-podcasts, Jennifer Wengler from tv.rub.de for her lecture on film shooting, the Gesellschaft für Geographie und Geologie Bochum e.V., and Mr. Köhler from the Biologische Station Östliches Ruhrgebiet, Herne, for their support. Special thanks go to the students Hannah Gildehaus, Stefanie Hinz, Oliver Huber and Carolin Reich who produced the introductory video-podcast linked to the eGeo-Trüffel plate and QR-code in Figure 2. Orthophoto image use by permission: ©Geobasisdaten: Landesvermessungsamt NRW, Bonn, 1689/2005.

References