Developing Interactive Map Apps for an Exhibition on the Topic 'Fremdsein': a Joint Endeavour by Students and Lecturers

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Abstract: The Faculty of Information Management and Media (IMM) at Karlsruhe University of Applied Sciences received funding for a project called 'Fremdsein 4.0'. It targeted experiences about educational migration through applying various media means. Two interdisciplinary workshops were conducted focussing on the German words 'Fremdsein' and 'Heimat' as main topics, which relate to feelings of "foreignness" or of being at home. Among other results, two Web map apps that help to reflect on the two terms were conceptualized and evolved over time to become part of an exhibition towards the end of the project. The paper starts with describing the various contexts in which the map apps are placed: maps used in exhibitions, a reflection on 'Fremdsein', interdisciplinary learning and conceptualizing, and finally Web mapping and personalized maps. Next, the process of the map app development is covered, which led to two robust browser-based offline apps named 'Ideal Home Finder' and 'Emotional Foreignness Ranking'. The former app, based on the research of Hofstede et al., makes use of empirically derived dimensions on cultural differences. By answering six questions, the user can find out in which countries he/she might feel at home. The latter app, which more directly resulted from workshop outcomes and personal experiences of the participants, allows to come up with rankings of emotional "foreignness" for five previously selected countries. We discuss and conclude with reflections on the two workshops, the developed apps and the exhibition.

Keywords: interdisciplinary workshops, Heimat, conceptualizing, Web mapping, personalized maps

1. Setting of the project and aim of the paper

The Faculty of Information Management and Media (IMM) at Karlsruhe University of Applied Sciences (HsKA) received funding for a project on 'Fremdsein 4.0' aiming at a grounding on different experiences in regard to educational migration at the university through applying various media means. Funding was granted within the framework 'campusWELTbewerb', organized by the two Baden-Württemberg Ministries for Environment (UM) and for Science & Art (MWK) with support of finep. Here, projects at universities were selected which aimed at engaging in global sustainability by bringing about local changes without ignoring the global ties.

We organized two workshops in early April and early June 2018. The start made a diplomat by sharing very personal experiences of feeling foreign and not at home, when sent to a country like Germany. This triggered self-reflection and awareness among the participants, fourteen students from eight different countries and six lecturers/staff, who then collected their experiences and thoughts around the two "hot words" 'Fremdsein' and 'Heimat'. It provided the ground for transferring the experiences of and implications by 'not feeling at home' into physical or digital items by multi-media means. Three groups were formed, one working on texts, one with photography and video, and another developing interactive map apps (Figure 1), with each group constituting

of lecturers/staff and students which stemmed from three of four study programme fields (technical documentation, culture and media, and geomatics) across the faculty. The groups worked independently but in particular during the workshop used the opportunities for sharing and discussing ideas including asking for contributions from other groups. The ultimate goal was an interactive multi-media exhibition to share the project outcomes within the university and beyond. It took place at HsKA for three weeks in October 2018 and provided a rather personal perspective on the diverse perceptions of "foreignness" inviting visitors of the exhibition for self-reflection in the every-day dealing with others.

Having thus introduced already the idea of aiming at an exhibition, which included interactive map apps as exhibits items, the following topics are covered in section 2 on the context: the role of geospatial data and maps in exhibitions, the terms of "foreignness" and feeling at home as potential topics to steer discussion among international students, the in teaching seldom fully tackled issues of interdisciplinary and conceptualizing, and finally the link of Web mapping and personalized maps. In section 3 the two map apps developed for the Fremdsein 4.0 exhibition are introduced providing background, explaining the idea for the app, listing its aims and describing the realization. Section 4 is dedicated to discussion and conclusions with an emphasis on teaching experience and exhibition observations.

Figure 1. The Map app group at work; top: conceptualizing potential interactive map apps during the workshop, centre: checking for data and understanding the data, bottom: introducing the ideas on map apps to the other groups (photographers: Dominik Müller (top), Maren Kropfeld).

2. A diverse context

Maps are commonly used in museums or exhibitions to provide spatial context for collection exhibits. Due to technical advancements, the communication of cultural heritage makes use of virtual modelling and rendering techniques to provide realistically looking scenarios. Nowadays it goes beyond images or pre-produced videos, offering interactive 3D applications to enable people an immersive exploration of collections for infotainment and inspiration (Trapp et al., 2010). A more recent example for supporting a narrative through collection items in an exhibition by means of maps was the exhibition "Around the world in 80 things" on display in the Musems for Communication in Berlin and Frankfurt (Germany) in 2014/15. Here, historical maps of the eight main itinerary stops of Jules Verne's chief character Phileas Fogg were juxtaposed with interactive map applications including an oversize map steered by gestures (Mücke, 2014). The idea for aiming at an exhibition fed by outcomes from workshops with students, however, arose from exhibitions about identities at the Christopher Newport University (Virginia) in 2016, which combined photography, video, audio, printed maps and interactive Web mapping display.

By focusing on residential racial segregation it could be shown that identity is fundamentally spatial (Finn, 2016 and https://www.livingtogetherlivingapart.com/ for an extension of the project).

Race is a topic, which one easily associates with US-American debates. In Europe the topic 'Fremdsein' as an experience of students due to educational migration (Greatrex-White, 2008) and the current debates due to migrants and refugees from the Middle East and Africa seeking a future in European societies (cp. a study on constructions of immigrants' identity, belonging and foreignness by De Fina, 2011) seem promising to initiate discussions among students. A rediscovery of regional identity has been identified as a counter-movement to globalization by Ratter & Gee (2012). According to them, 'Fremdsein' may be translated with "foreignness" and alienation and is opposite to the rather German concept of 'Heimat' with the closest translation being homescape or homeland. The difficulty to translate 'Heimat' stems from the term's multiple facets (geography, psychology, ethnology-wise), meanings, and contexts of use. It is linked to early socialization experiences, but recreated again and again through active engagements with other peoples and neighborhoods, as well as closely linked to feelings of identity, i.e. rootedness. Windsong (2010) point out that feeling-at-home cannot be treated as being the same as home ownership and place attachment (sense of place). But people feel connected to a place and thus responsibility for 'Heimat', which creates willingness to e.g. become involved in preserving it (Ratter & Gee, 2012 targeting coastal management in the German Wadden Sea). Peterlini (2010) argues that humans must leave familiar surroundings for the merit of development towards a social "me", which goes in hand with a deeply felt loss of care and security leading to ideas of defending the "own". In this context, Greatrex-White (2008) studied the relationship between study abroad, positive disturbance and the development of students which indeed supported the development of culturally competent practitioners, thus claiming for its far greater attention in nursing education, which we believe can be extended to higher education in general.

Seldom covered within university teaching are inter-disciplinary tasks and thorough conceptualizing. In order for human to adapt to reality and to be creative, according to Andreevna & Vladimirovich (2014) students need interdisciplinary learning, while Bondareva et al. (2014) call for cross-cutting education and Carr et al. (2018) prefer the term cross-disciplinary to capture multi-, inter- and transdisciplinary type research. For the latter authors it is essential to combine knowledge and understanding from different disciplines for addressing the challenges which society is facing. Interdisciplinary research and education programmes, which support interaction and shared understanding, provide the basis for developing interdisciplinary research skills in the future generation. However, for this the difficulty that the same word can have different meanings in various disciplines need to be overcome (see Andreevna & Vladimirovich, 2014).

The conceptualization stage, i.e. the idea creation process, is considered central but difficult in project management. It decides on how well a project is defined and appropriately scoped. Idea statements are anything considered important or interesting. They require analytical thinking (for picking apart) as well as synthetical thinking (incl. different perspectives) in the reflection, as the numerous statements need to be collected and connected (synthesized). The debate aims at creating a clear majority agreement for coming up with a system of connected elements, where the connections are determined by the purpose. This way, Joham et al. (2009) foresee a feasible, democratic, creative as well as useful project conceptualization. According to Morschheuser et al. (2017), intrinsic motivation is caused by allowing a participant to be creative, to experience autonomy, to develop own skills, and to feel competent.

Harvey & Kotting (2011) propose an active-learning approach for students to have fun when engaged with the potentials and challenges of modern cartography, i.e. aiming at gaining useful skills for solving problems in digital mapping with creativity through reference to conceptual issues and in a collaborative process. Web technologies (in particular HTML, JavaScript and SVG) have greatly advanced concerning graphics and data manipulation, thus enabling the development of engaging and highly interactive sites. Online thematic mapping has been further popularized through trends as infographics and story-telling (Smith, 2016). Web maps commonly are adaptive, interactive, mobile, multiscale, and/or updated in real time. For students it is therefore important to learn to combine web mapping technologies, as done in real-world development, based on an ever-changing myriad of open source client-side web mapping technologies to choose from (Roth et al., 2014).

There is the demand for personalized geoservices, with mobile maps being even more personal services due to small display sizes (Meng, 2005). The current web-mapping platforms are to be enriched via data mining (see Google Maps) for reducing information overload and instead modelling user's tastes and intentions addressing also application efficiency. This is done comparable to mass customizing in marketing based on studying the actions and techniques of users when browsing Web documents (Ballatore & Bertolotto, 2015; Wilson et al., 2010). It includes mining user preferences from geo-textual texts for personalizing user experience on maps (Zhao et al., 2016), or user profiling and implicit feedback analysis for automating personalization of the map-making process (Ballatore & Bertolotto, 2015). Tracking task interactions allows to provide user's individual preferences in personalized interactive maps thus simplifying the completion of tasks. Data mining is applied for operationalizing the gathered user data for personalizing adaptive map rendering (Wilson et al., 2010). Meng (2005) refers to design patterns for adopting content and presentation styles to both the actual requirements and the cognitive abilities of individual mobile users. Important for the user is to relax in order to become more efficient, for which it helps to provide egocentric maps. For the latter also the term MOMM was coined, being short for "me on my map" (Peterson & Cammack, 2015). Christophe et al. (2016) worked on a service-oriented extension of the SLD/SE specifications to allow for personalized and institutional maps by managing extended map specifications by means of controllable expressive rendering methods. To summarize, user-centric maps are based on user-map interactions, adaptation of content, functions, appearance, technology in use or information demand to individual users (Weninger, 2012).

Besides, other ideas exist, what a personalized map means. The mapping of user activities, e.g. use of transport modes in urban spaces, via the user's smartphones can lead to a person's personal map by applying artificial intelligence and statistics techniques (Teixeira & Bento, 2010). Or user's preferred travel destinations, according to landscape preferences based on 15 features, can be located on a personalized map of the Netherlands (in its beta version of Europe, see http://www.myplacetobe.eu), which is unique for each user. The tool's usage is mainly linked to finding the ideal landscape, but some are also playing around with the indicators for achieving a certain result which they have in mind (Goossen et al., 2009). In this context, Crampton (2001) reminds us on Harley's 'Deconstructing the map' (1989), with maps being social constructions only which can be interpreted in multiple ways. Instead of worrying about map objectivity, we can thus appreciate the diversity of cartographic forms beyond those corresponding to reality best. Here visualization, as opposed to communication, plays a central role as human's ability to develop mental representations.

3. Map app development

3.1 'Ideal Home Finder' map app

3.1.1 *Background*

Geert Hofstede, Gert Jan Hofstede, Michael Minkov and others offer six "dimensions of culture" (Figure 2). These describe basic issues for society to organize itself (based on a comprehensive study of how values in the workplace are influenced by culture; collected at IBM from 1967 to 1973). The dimensions do not exist, they are the product of our
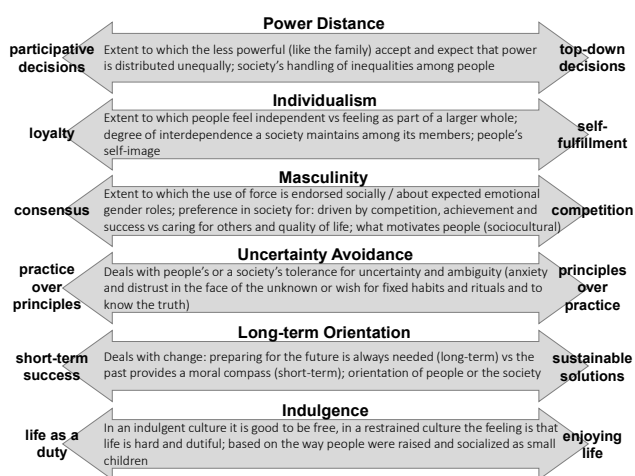

Figure 2. Explaining the six dimensions of culture by Hofstede et al. (Hofstede, 2018; Hofstede Insights, 2018; IKUD Seminare, 2018).
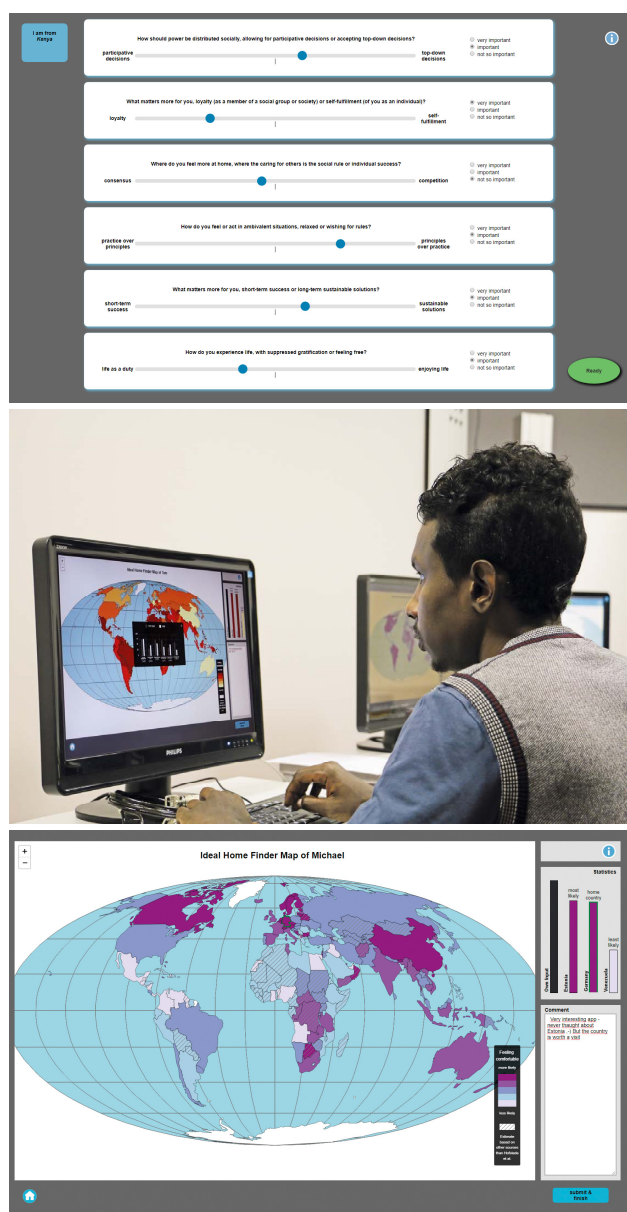
Figure 3. Screenshots of the 'Ideal Home Finder' app; top: answering six questions by moving sliders, centre: comparing own ratings with a chosen country (photo: Christian Seitz), bottom: a personalized world map to be shared.

imagination. Culture is defined here "as the collective mental programming of the human mind which distinguishes one group of people from another". As such, culture influences patterns of thinking which again is reflected in the meaning that people attach to various aspects of life and which become crystallized in the institutions of a society or as habitus in various social milieus. Obviously, everyone does not think the same, but most of us are strongly influenced by social control. So any statement on the culture of a nation is a generalization. The cultural dimensions represent independent preferences, which distinguish countries from one another and only become meaningful by comparison (Hofstede, 2018; Hofstede Insights, 2018; IKUD Seminare, 2018). Today Hofstede's work is continued in the GLOBE project (https://globeproject.com/) which defines nine dimensions and focusses more on societal culture in institutions and enterprises.

3.1.2 Idea for a Map App

Today, people do not only travel to experience other countries, they also consider spending time abroad to study or work. Questions arise if one would feel comfortable or could even feel at home in these countries. Instead of checking each country individually, the idea is to allow for a worldwide comparison based on Hofstede's dimensions of culture.

3.1.3 Aims of the 'Ideal Home Finder' App

- By providing a world map, a global view is offered to the user presenting parts of the world, which might not currently be in the mind of the user.
- By considering user input, the world map is personalized and therefore more attractive as it talks / responds to the user.
- By including interactivity, the user can explore the map, which prompts visual thinking about what is reflected on the map.
- By offering a comment field, the user can share his/her discoveries, opinions or feelings with others.
- By making other users' world maps and comments available, the map app does not remain a personal effort but opens up to others and thus widens reflections.

3.1.4 Realization of the 'Ideal Home Finder' App

The app (Figure 3) consists of five components: user input via rating, visualization on a world map, interactive exploration tools, a possibility for comments and data storage. It starts by asking the user one question per dimension, which results in a rating of what the user considers to reflect his/her ideas of feeling comfortable in a society. By also requesting an importance ranking, the app derives a value per country by means of calculating the weighted sum of the differences between the values specified by the user and those gathered by Hofstede and others. Hofstede's dimensions are not available for all countries. Data preparation therefore included to search the Web for additional clues, considering here only countries with an area larger than 5000 km², i.e. those visible on the world map. These values are visualized on a world map (Mollweide projection) using five colour shades and can be considered as an indicator for the likelihood of feeling at home in a certain country. Hachures are added for those countries where dimension values were inferred from other sources. A summary statistical graph reveals the most and least likely countries for feeling at home in comparison to the home country and the own rating. Interactivity (a statistical graph per country on mouse click action) allows exploration of which of the countries based on an own rating would fit best to the user's cultural expectations and why. A comment field allows for statements as the user might discover that the resulting world map does not match with own experiences or expectations and wants to reflect on it. Only with the user's consent, his or her input is stored anonymously (using an alias name) together with the resulting world map which can thus also be viewed by others when opening the gallery. During the exhibition an extra monitor provided a loop of the stored world maps.

Technically, for the exhibition a robust offline version of a browser-based application employing mainly HTML5 and JavaScript (Leaflet, PROJ, Chartist) was favoured. The app is database-driven (using SQLite) for storing user input und results. As geodata we used Natural Earth 4.1.0 Admin 0 – Countries (1:110m scale, slightly modified).

3.2 'Emotional Foreignness Ranking' map app

3.2.1 *Background*
This app is an idea, which evolved during the conceptualization phase for potential map apps, inspired solely from having brainstormed on the "hot words" 'Fremdsein' and 'Heimat' during the first Fremdsein 4.0 workshop.

3.2.2 *Idea for a Map App*
"Not feeling at home" is a very personal experience. For every individual it is linked to other aspects of life. Such aspects could be food, experienced freedom, and weather, surrounding landscape, vegetation or culture among others. However, depending on how you were brought up, the experience of particular aspects e.g. food differs: German people are particular about bread, Indians complain about the rice German people prepare, and what is called 'ugali' in Kenya is named 'posho' in Uganda and 'papp' in South Africa but it was claimed not to be the "same". With the world getting smaller due to globalization and affordable travelling for many, our hypothesis is that "Not feeling at home" is nowadays not necessarily related to the physical distance from home. We want to show this.

3.2.3 *Aims of the 'Emotional Foreignness Ranking' App*
- By selecting countries based on an interactive world map, the user's choice is not biased from the start but done on the widest possible range.
- By asking for five countries to select, a balance is sought between stretching across people's world and feasibility for a meaningful ranking.
- By providing a mix of set and open aspects or items to rank, user results can be directly compared as well as that it allows for unexpected ideas.
- By adjusting relative closeness between ranked countries, the user spends more time thinking about "foreignness".
- By offering a comment field, users can share the ideas behind their selection reasons for rankings, or comment on what they have learned.
- By making a printout of the result available, users have something to take home and use for further reflection.
- By making users' results and comments available, the many app outputs are likely to inspire others when adding their views.

3.2.4 *Realization of the 'Emotional Foreignness Ranking' App*
The app (Figure 4) asks for six tasks by the user: First, by means of an interactive world map the home country as well as five countries have to be selected for a ranking on "foreignness". Next, the user learns about fixed aspects as well as to what regard choices for a ranking still have to be made. Third, the countries' order needs to be swapped by the user and, further, distances in regard to being more "similar / close" or "foreign" can be adjusted based on personal experience or expectations. When finished, the user hits a button and the final output layout is prepared displaying thrice the five countries in regard to the chosen order per topic and adding a pearl-string revealing the relative distances on closeness/"foreignness". Below a feature on the true physical distances of the countries (in regard to their center points) is added, which are automatically calculated. This allows for comparison and thoughts. A text field provides the opportunity for leaving a statement/comment. Finally, a PDF is created which can be printed for taking home. In addition, there is the option of opening screenshots of other user results (if prior consent was given, which also includes permission to store the user input).
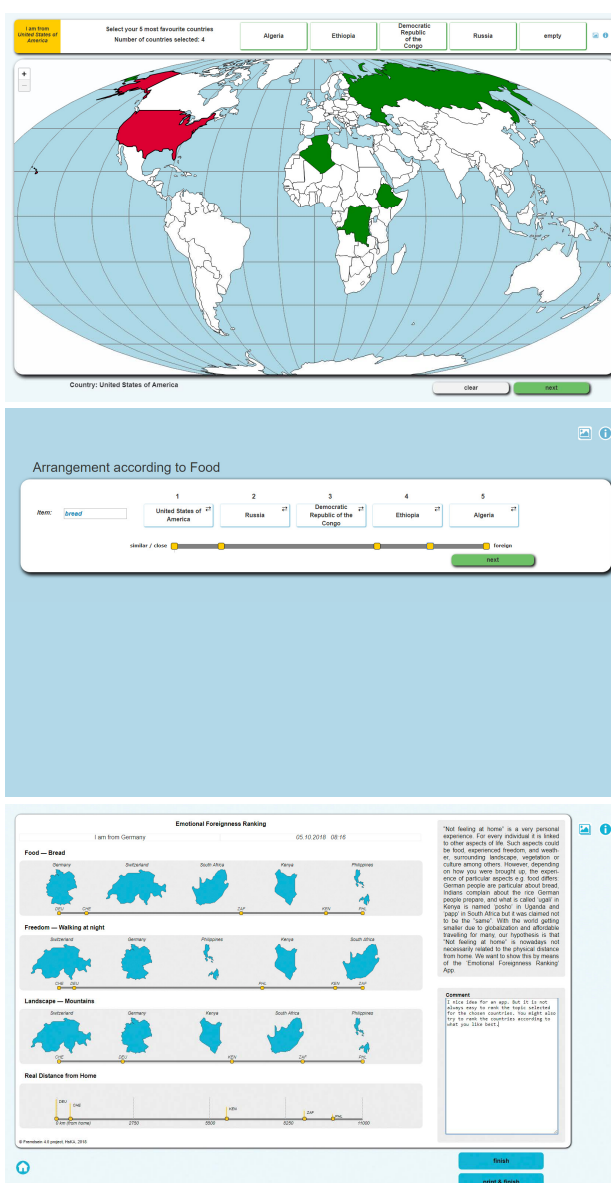

Figure 4: Screenshots of the 'Emotional Foreignness Ranking' app; top: selecting countries via a world map, centre: determining closeness factors and switching the order of the countries to rank, bottom: final output page including physical distances.

Technically, for the exhibition a robust offline version of a browser-based application employing mainly HTML5 and JavaScript (Leaflet, PROJ, Chartist) was favoured. The app is database-driven (using SQLite) for storing user input and results. As geodata we used Natural Earth 4.1.0 Admin 0 – Countries (1:110m and 1:50m scales, slightly modified).

4. Discussion and Conclusion

In the first workshop on 'Fremdsein 4.0' it became very soon apparent, that to the student participants very personal experiences mattered instead of opting for a political debate. Likely reasons are that most of them were international students within their first months/year in Germany as well as the influence by the "keynote" presenter who had shared very personal experiences. Students studying abroad feel themselves suddenly as foreigners. In agreement with Greatrex-White (2008) the students expressed or reflected similar experiences of detachment from the familiar as well as awareness triggering in regard to identity, culture and otherness, exclusion or isolation due to language barriers, re-creating a 'feeling at home', and thus a highly appreciated view of studying abroad. Also our students, mainly the new international arrivals, expressed gratitude for participating in a different style of engaging as compared to normal classroom debates, what Greatrex-White calls involving emotional intelligence. Peterlini (2010, on South Tyrol in Italy) showed that by solely discussing and reflecting the concept of 'Heimat' with others can change it. Thus, the mere reflection in the context of 'Fremdsein' and 'Heimat' can be of benefit to the social intercourse and participation by softening clichés and making the often rigidly appearing system "Heimat" fertile. The mere number of different statements made by the students reflected spatial, social and emotional components and created awareness for people's subjective social as well as individually experienced intangible values (cp. Ratter & Gee, 2012).

Two map apps and not just one were developed in order to reveal the spread of ideas during the first workshop, with one completely based on student ideas, while the other was based on an idea in the mind of the supervisors. We are not sure if map app development was a truly interdisciplinary task, but within the 'Ideal Home Finder' the students combined knowledge from different disciplines (cp. Carr et al., 2018). A social science concept applied as management tool was combined with knowledge from the own field of geomatics, thus challenging creativity. Having taken all the time needed for jointly conceptualizing the two apps, i.e. first collecting whatever ideas plus then narrowing the map app development down to two promising and distinct apps and thinking them thoroughly through, every participant felt involved and part of the group although later the apps where programmed by a fewer number of people. As such, project conceptualization turned out to be feasible, democratic, creative as well as useful, the aims as stated by Joham et al. (2009). For the lecturer it was a new exciting approach taken, as conceptualizing is commonly limited per se by the task description handed out to students, who often do not see the need for a more detailed concept or are predominantly led by their skills and experiences gained so far. As such,

the Fremdsein 4.0 project added another experience of a distinct working atmosphere as compared to "normal" lecturing during the academic semesters (cp. Schaab et al., 2018), although it proved more difficult to hold the group together as compared to a summer school.

Nowadays via the Internet, millions of users are regularly accessing mapping services or making use of geolocated media in the social media. However, according to Smith (2016), limited accessible socio-economic data (particularly in the Global South) restrict the development in online socio-economic cartography. The 'Ideal Home Finder' app is based on cultural indices, which were gathered for a global, interactive Web map at country-level. According to a survey of Web map designers/developers by Roth at al. (2014) participants rated interactivity as the most essential characteristic of Web maps that should be supported by Web mapping technology. Both our map apps are highly interactive-dynamic, leading to personalized maps based on user input. As shown earlier in the paper, there is a trend of aiming at personalized maps, with user-centric, egocentric maps or MOMM being other terms used. Efforts are closely linked to operationalizing the customizing of map services which heavily contributes to maps as social constructions (see Crampton, 2001). For the two map apps described here, the output is more of a personal map, which is personalized depending on user input (selections and answers provided). The 'Ideal Home Finder' app is similar to the myplacetobe.eu app by Goossen et al. (2009), which also want the user to find an ideal "home", although in Europe and based on landscape preferences and preferred holiday activities. Our app lets the user reflect on socio-cultural values across the entire globe. Such map tools based on direct user input considering society-related issues provide examples for user-created, individual maps as social constructions in the most narrow sense.

The official opening of the exhibition pulled more than 40 people together with the aim to provide an introduction to the exhibition items and to make the exhibition known within the university. Overall, the exhibition aimed at revealing the interdisciplinary potential within the Faculty IMM. Despite a placement within a well-visited university space, offered by the library for students to study, the exhibition seems not to have drawn as many visitors as wished. One reason for this is that a lively culture of cross-cutting debates involving staff and students on specific topics is missing at the university. Also, English still seems a hindrance at an engineering-focused university of applied sciences in Germany. Here, a person to engage with the visitors would have helped. This in combination with the use of highly attractive infotainment in immersive virtual environments (Trapp et al., 2010) or through interaction via gestures (Mücke, 2014) would, however, require constant support and supervision of high-end technical equipment, something a small exhibition at a university is not able to offer. Instead, inspiration through interacting with personalized views of our world to reflect on cultural closeness or "foreignness" of other countries is possible by means of Web mapping technology and use of simple PCs, similar to from where the original idea for
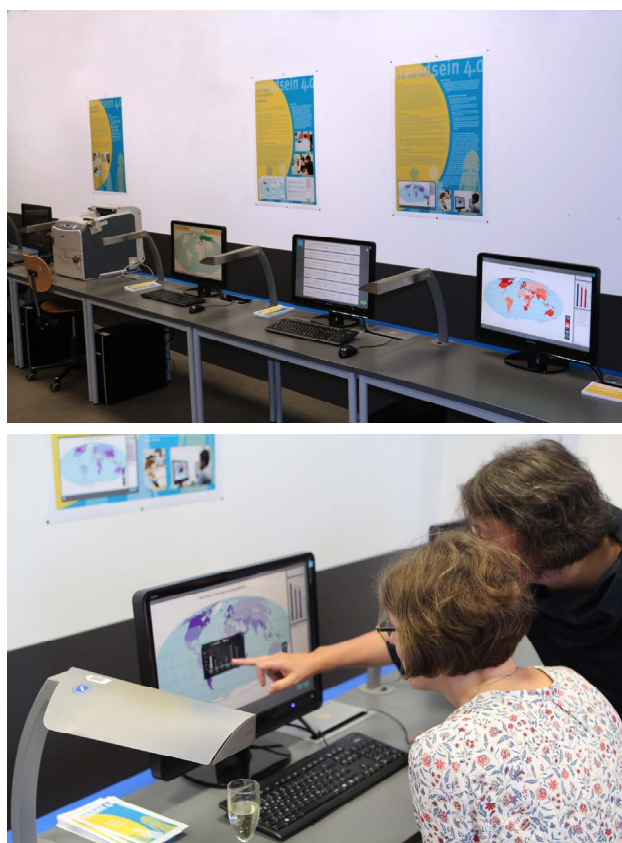
Figure 5: Impressions from the Fremdsein 4.0 exhibition; top: exhibition set-up of the two interactive map apps (photo: Christian Seitz), bottom: visitor of the exhibition testing the 'Ideal Home Finder' app (photo: Dominik Müller).

such an interdisciplinary cross-faculty spanning exhibition project had originated (cp. Finn, 2016). But it needs more for drawing attention, at least at our university, than a set-up with posters, flyers and a monitor displaying user results in addition to the possibility of engaging with the tools (Figure 5). In comparison the walls with photographs are likely to have drawn most attention due to their perfect set-up but also as they ask for less time from a visitor. In the course of three weeks little information was stored in the databases of the two map apps. As it does not allow to confer on the total number of users, one could think of next time collecting additional data on app usage (e.g. recording the number of times a tool was activated or the amount of time spent by a user; cp. Trapp et al., 2010).

Nevertheless, the topic 'Fremdsein' proved to have been a well-chosen topic, which became obvious by the overwhelming feedback of the participating students. At the same time we got aware that international students seem more open to get engaged in additional workshops which do not add to study credits. With such a positive feedback also by the visitors of the exhibition opening on the combination of exhibits and overall set-up, it was only consequent to have turned the exhibition after its closing into a virtual version accessible via the Internet (https://www.iaf.hs-karlsruhe.de/gvisr/project/fremdsein40.html). Although it asked for more programming concerning the two map apps, as we had opted for robust offline exhibition versions in an openly accessible space. For us the virtualization serves as accessible archive of this first interdisciplinary effort of the

Faculty IMM, the chance for those students who had left Germany already at the time of the exhibition to finally visit their exhibition, plus for demonstrating one more media capability available at the faculty. In regard to the two map apps it is making visible what Geomatics-related students can achieve nowadays via programming in the field of Web mapping. There is also the chance now of eventually collecting enough user input for a statistical analysis on the topic 'Fremdsein' as envisaged by the two apps, this then embedded in a well-defined study concept and Internet campaign. Returning to the map apps will allow then to also cover web map usability issues, with the opportunity to implement the apps with a responsive design.

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