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CREATIVE SPACE IN DESIGN EDUCATION: A TYPOLOGY OF SPATIAL FUNCTIONS

Katja THORING[1], **Carmen LUIPPOLD**[2] **and Roland M MUELLER**[3]
[1]Anhalt University of Applied Sciences, Dessau
[2]Bauhaus University, Weimar
[3]Berlin School of Economics and Law

ABSTRACT
This article analyses the role of the space for facilitating creativity, especially in the context of creative education. Based on a qualitative user research with cultural probes, five different types of creative spaces were identified: 1) the "Solitary Space", which allows thinking and meditation, and which is characterized by a silent atmosphere, 2) the "Team Space", which invites people to communicate with each other, and which is characterized by noise, playfulness and team interactions, 3) the "Tinker Space", which allows people to experiment and to build stuff, e.g. in the university's workshops, and 4) the "Presentation Space", where people can actively present and show their work, or passively consume input (such as lectures). Additionally there are "Transition Spaces", like hallways, which are used for informal exchange and chats as well as to withdraw from the focused creative work. Independent from the type, different functions of a creative space could be identified, such as a) space as a knowledge repository, b) space as an indicator of a specific culture, c) space as a process manifestation, d) space as a social dimension, and e) space as a source of stimulation. The paper suggests characteristics and criteria for each of the types and functions. The results are summarized in a framework. The work presented in this article may contribute to a better understanding of the impact of the space design for creative design education, and might also be used for design educators to improve the design of their classrooms.

Keywords: Creative space, classroom design, campus layout, creativity, cultural probes

1 INTRODUCTION

In our homes, we structure space according to different activities. We prepare food in the kitchen, eat and chat in the dining room, and welcome guests, watch films or read books in the living room. The bedroom, in which we rest, has a more private character, as well as toilets and bathrooms, which are intended for personal withdrawal. Cellar and garret are domains for things we do not need that often. All spaces are designed and appointed according to particular functions. They indicate activities and tasks, as well as typical behaviours. Housing space is designed to facilitate manufacture, preparation, representation, communication, privacy, and storage. But how are the layout and design of our homes tied to design education, creativity and space? Looking at design practice and education we are able to identify similar substantial key activities: inspiration, communication, experimentation, creation, decision-making and presentation. As well as in our homes, these actions are related to specific types of space. This paper is intended to systematically analyse different types and functions of creative spaces in design education. The introduced framework is considered as a first step towards the understanding of creativity and space, which can lead to new attempts in the constitution of space for design education and practice.

This article is structured as follows: Section 2 presents an overview of related work. Section 3 provides a description of the main research source—the cultural probes methodology. Section 4 presents a brief summary of the findings. And Section 5 suggests a resulting typology, in which the different types and functions of a creative space are aligned, according to the findings from the cultural probes and the literature review. We conclude by discussing our findings and give an outlook to future work.

2 RELATED WORK

Even though technology and the Internet seem to diminish the importance of distance, space is still a critical factor for collaborative creative work. However, there is limited scientific research on the effect of the work environment on creativity [1]. Lee et al. [2] analysed the effect of location on scientific output. They geocoded the precise three-dimensional position of collaborating scientists and found that the physical proximity is a high predictor for the scientific impact. The effect was valid on the micro as well as macro level (different city, same city, same building). Jankowska and Atlay [3] distinguished three types of learning spaces: S-space (Social Learning Space), F-space (Formal Space), and C-space (Creative Space). They found that C-spaces enhance creativity by visual and aesthetic features, writable walls, flexible layout, and special technologies. Haner [4] looked at two cases of innovative office layout: the Interactive Creativity Landscape and the Learning Garden. They analysed both cases for their properties for supporting divergent and convergent thinking of teams and individuals. Kristensen [5] analysed one case of an innovation space according to the support of different phases in the creative process. They found that the preparation and incubation phases require a combination of private and communal space. The incubation and insights phases require a more private space. Snead and Wycoff [6] mentioned some ideas for creative spaces. A creative space should allow interaction and movement so that people and ideas can be grouped and moved. Therefore small tables for 4-5 people are preferable to large conference tables. Whiteboards, Post-it notes and coloured pens should encourage visual thinking. A creative space should be beautiful, encourage fun and create an atmosphere of abundance. Von Thienen et al. [7] analysed the role of space in Design Thinking. They asked students of the HPI Design Thinking program about spaces that created a similar feeling like the HPI d.school spaces. They came up with three space types: home, café, and playground. They also asked for spaces that make it difficult to live Design Thinking. They found three space types: prison, conventional classrooms, and libraries. Furthermore, they looked at the material indicators, behaviours and feelings that distinguish them.

3 QUALITATIVE USER STUDY WITH CULTURAL PROBES

The foundation of this research study is based on the analysis of a set of cultural probes, which were handed to nine selected design students within the Anhalt University of Applied Sciences in Dessau. Cultural probes is a method for qualitative user research [8], which provides participants a set of tools, typically consisting of single-use cameras, user diaries, maps, postcards, or the like—each item added with some instructions, how to use it. The participants can then take these probes home or to another place relevant for the research, and work on these tasks for a specified time (usually a couple of days). The advantage of this method is that the researchers do not need to be present the whole time, and also that the participants do not feel observed and therefore may provide more personal information. The cultural probes box that was prepared for the participants of this study contained the following items: 1) A single use camera with 27 pictures. A cardboard frame and an arrow could be used to highlight important aspects within the photographed motifs. 2) A campus map and floor plans of some selected buildings. 3) Sticky dots with icons and numbers to indicate positive and negative spaces on these maps and floor plans. 4) A list for additional information about the marked places. 5) A diary with some pre-defined captions on some of the pages, such as “this is how I organize my workplace”, or “I would like to have my workplace in this movie … because”, or “my typical postures when I’m working”, and so on. Additionally, we collected some behaviour samples by sending unanticipated text messages to the participants, in order to enquire details about the situation they were in when receiving the message. Those details were also to be illustrated in the diary. 6) A postcard on which the participants were supposed to visualize their perfect (imaginary) creative workspace. 7) A journey map of one arbitrarily selected project by the participants, which should show the process of that idea in eight steps, regarding the frequented locations. 8) A tag cloud with words around the topic of creative space to inspire the students and to indicate what kind of information we were interested in. 9) A bar of chocolate, chewing gums, and a bag of tea for a creative break. On the back of the wrappings we provided some questions about the qualities of the particular space the participants were in, when consuming these goods. 10) Three pens (red, green, and black) to use for filling out the maps and diaries. 11) A blank CD for additional digital files. See Fig. 1 for an overview of the box.

The nine participants were chosen to represent a broad range of different students on the campus: One was a Master student from the International Master of Design (originating from China), eight were Bachelor students of the German program of Integrated Design (four in 3rd term, four in 5th term).

Overall there were six female and three male students. They were all provided with the same box of cultural probes (all in German language, except for the one for the international student which was in English). The students had a total of two weeks time to work on the cultural probes and to fulfil the above-mentioned tasks. Although the focus of the study was the creative space on the campus and within the classrooms of the analysed educational institution, the students were also allowed to provide information about external spaces (within the diaries and on the maps), as well as about fictitious or desired spaces (within the diaries and on the postcard).

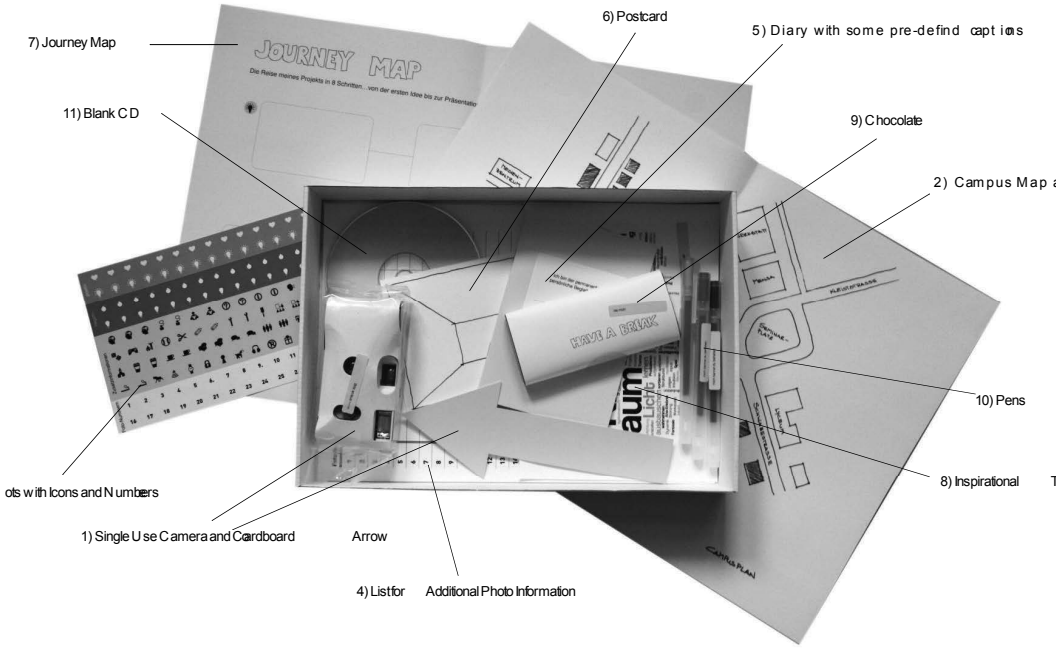

Figure 1. Contents of the cultural probes box

4 RESULTS

This article focuses on the evaluation of the campus maps and floor plans, as well as the corresponding photographs along with the additional information the students provided on the photo-list. The analysis of the remaining elements of the cultural probes box will be provided in future work. Figure 2 shows an overlay of all the campus maps from the nine students, which allowed us to identify areas with frequent indications of positive or negative aspects of the space (this was possible by tracing the green (grey) and red (black) sticky dots on the maps). Additional information about what was positive or negative about the specific places could be extracted from the photo-list, provided by the students, or it was enquired in follow-up interviews. The students also provided information about their main activities in the respective spaces, indicated by the yellow (light) dots.

The students indicated which spaces they found positive and which negative, and they also provided some information about their reasons for this classification. However, at this point we did not analyse the flaws and merits of these spaces, but we tried to identify only the different types of spaces the students mentioned, as well as the functions these spaces had for the creative work of the students. If, for example, a student identified one place as negative, because the layout of the tables did not allow teamwork, we concluded that a place for teamwork might be one of the types of spaces that are important for creative work. At the same time this statement indicates the function of a space to enforce a specific working process. The layout of the tables and chairs supports one specific way of working or prevents another one. In that way we were able to classify different types and functions of creative spaces, by extracting such insights from the students' output. Our findings are summarized in the next section. An evaluation of the positive and negative aspects of the specific space situation within the analysed university will be provided in future work.

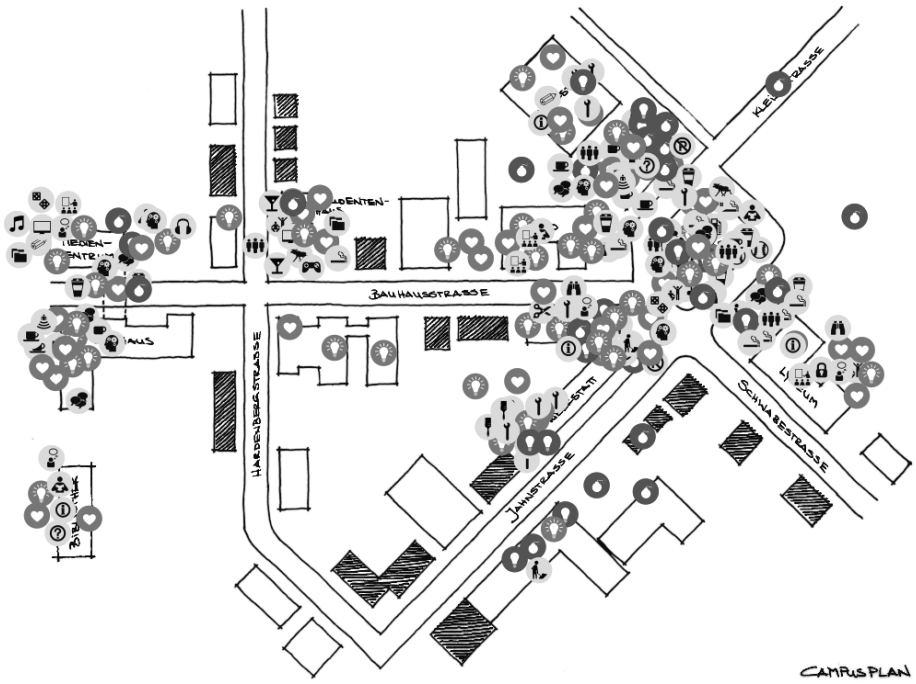

Figure 2. Indication of positive and negative spaces and main activities on provided maps

5 TYPOLOGY

For evaluating the collected insights, all the relevant source material from the photo-lists and the follow-up interviews were analysed by three researchers. All quotes from the interviews where transcribed and written down on post-it notes. The source of the quote (the interviewee) was coded by the colour of the post-it note. Then, the post-it notes were clustered according to the similarity of the material by the three researchers. Data, codes and clusters were compared constantly with each other and merged, split, named and renamed if necessary. This procedure was repeated until no further categories were emerging (theoretical saturation).

We could identify five types of creative spaces as well as five functions. In the following section we describe the characteristics of these types of creative spaces as well as the different functions these spaces might have. The functions and types seemed to be orthogonal to each other—one type of space could incorporate several functions, and some functions could be aligned to several types of spaces. Due to the additional information the students provided, we could identify diverse significances of the functions in reference to the different types of space. This resulted in our suggested typology, which can be found in Table 1.

5.1 Types of Creative Spaces

The "Solitary Space". Just like a monastery, the "Solitary Space" allows thinking and meditation and is characterized by a silent atmosphere. People use these spaces for personal withdrawal. Examples for such spaces, extracted from the students' answers, included their homes, a train ride, or the university's library.

The "Team Space". This is a creative space that invites people to work together as a team, and to exchange ideas and communicate with each other. It is characterized by noise, playfulness and team interactions. In an ideal team space, students can leave their interim work and the layout of the room allows group work and discussions. Except for some of the classrooms, there were not many dedicated team spaces on the analysed campus.

The "Tinker Space". This is a term for a creative space that allows people to experiment and try things out, and also to build stuff. Examples include the university's workshop, print shops, photo studio, and partly also the students' homes or some of the classrooms.

The "Presentation Space". This is a term for a creative space where people passively consume input (such as lectures) or actively give input themselves (such as presentations). Usually such lecture rooms do not allow (active) teamwork, due to their chair and table layout, but provide the possibility to give and get feedback. Also, this type of space includes passive display of work results in an exhibitionary manner, e.g. models in showcases, or posters on walls.

The "Transition Space". There were some spaces that could not be classified as one of the four above mentioned, e.g. hallways, outside spaces like parks or parking lots, the Mensa and students' café, or pathways (transitions) between the other four types of spaces. These are obviously not dedicated areas for creative work, but seemed to have an important impact on the creative work for most of the students. Especially unintended meetings, running into each other by chance, or the possibility to take a short break are aspects that characterize such "Transition Spaces". Many students mentioned the positive inspiring influence of walking from one building to another or that they liked the hallways in which relevant or inspiring information was displayed.

5.2 Functions of Creative Spaces

Space as a Knowledge Repository. One interesting aspect of a space is its capability to serve as a knowledge repository. Information can be stored in shelves (in the form of books, materials, notes, pictures etc.), or on the walls (e.g. sticky notes on whiteboards). Knowledge might be represented visually, so that other people can access it easily. Another example that fits into this category are work results (e.g. models or posters) from more advanced students that incorporate knowledge, which could be extracted or used as a source of inspiration.

Space as an Indicator of Culture. A space can serve as an indicator of a specific culture. It is common sense that you have to be quiet in a library, or that you are allowed to produce noise and dirt in a workshop. It is important that a specific space culture is established to avoid misuse and to provide an appropriate atmosphere for the creative work. In a way, every space expresses the way one should behave in it embedded in the layout or just by common sense.

Space as a Process Manifestation. The space can also enforce specific procedural behaviours. E.g. tables and chairs that are mounted on the floor in a lecture hall, do not allow group work. Flexible furniture is a very important aspect to provide for different types of creative work. Students declared as positive aspects of a space if there were dedicated spaces for different activities, e.g. if the space for discussion was clearly separated from the space for computer-based work, even if in the same room. If there is the possibility to store interim steps of a project within a space (such as interim models), this is also an indicator of the process. Teachers and co-students can read the status of the project by looking at these materials. Moreover, for a smooth workflow it is helpful if the different types of spaces are aligned next to each other or within short walking distance.

Space as a Social Dimension. Social interactions with other students or between teachers and students are an important aspect of creative work. Spaces that allow e.g. group discussions just by the layout of chairs and tables, were indicated as positive by the students. Some spaces even enforce accidentally running into each other (especially the Transition Spaces), which might support the exchange of information.

Space as a Source of Stimulation. The space can act as a source of stimulation, e.g. by providing structures and textures on the walls, or by displaying inspirational posters or by providing games and gadgets. On the other hand, space may also trigger creativity by reducing stimulation. The lack of textures and noise might be able to trigger a creative flow [9]. Many students mentioned that the silent and non-distracting atmosphere in nature, in a train with passing landscapes, or in the restroom helped them focus their creative energies.

5.3 Framework: Types and Functions of Creative Spaces

Table 1 shows the suggested framework of creative spaces, including the different types and functions that have been identified. The plus signs indicate the degree to which the respective type of space is able to offer the indicated function(s), as it was suggested by our findings. As the framework shows, most types of spaces can incorporate two or more of the identified functions, but none includes all of the functions. Therefore, different types of creative activities require different types of spaces supporting them. Similarly, the functions of a creative space can be aligned to several types of spaces. Interesting are the missing marks: For example, the Solitary Space does not enable social interactions, nor does it provide a lot of stimulation. On the contrary, the aim here is to clear the mind by avoiding stimulation. Other types of spaces provide a lot of stimulation (such as a Tinker Space—e.g. a workshop—provides noise, smells of materials, which may or may not be a positive aspect). Of course, every space type could provide every function—at least in theory, but in reality, particular functions were more common for specific types of spaces. The question arises, in what way different

functions and spaces can overlap, without interfering but underpinning each other. This question warrants further research and might be evaluated in an experimental setting in future work.

Table 1. Suggested typology of creative spaces

Function: / Type:	Solitary Space	Team Space	Tinker Space	Presentation Space	Transition Space
Knowledge Repository	+	++		++	+
Social Dimension		++	+	+	++
Culture Indicator	++	++	++	++	+
Stimulation		++	++	++	
Process Manifestation		+	++	++	+

no coverage [ ] partial coverage [+] full coverage [++]

6 DISCUSSION AND CONCLUSION

There are different types of creative activities: inspiration, communication, experimentation, creation, decision-making, and presentation—these activities also require different types of spaces to support them. Thinking needs a different space than modelmaking, and finding inspiration needs a different environment than presenting ideas. The goal of this study was to identify different categories of creative workspaces and the respective functions of these spaces. Based on a research approach with cultural probes and an additional literature review, we distinguished between five types of creative spaces and five functions, which were summarized in a framework. As space is part of the didactic arsenal of any educator, a better understanding of the relationship between creative functions and space types may help educators to align their particular classroom designs to their students' needs in the creative process. The typology provided in this paper might help them to fulfil this goal. It is considered as a starting point for a comprehensive analysis and improvement of creative spaces in an educational context. The remainder of the cultural probes data will be evaluated in the next step, along with the development of more detailed architectural suggestions, based on the analysis of different educational and also corporate institutions. And finally, we would like to design a hypothetical "perfect" creative space—what do we have to consider if we can design an educational creative space from scratch?

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