Opening the Cultural Probes Box:
A Critical Reflection and Analysis of the Cultural Probes Method

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Abstract: Cultural Probes are facing an increasing popularity as a research method in design science and design research. However, the making of a cultural probes set requires a lot of time and resources for both, researcher and participant. A careful design of such cultural probes sets is crucial, to avoid waste of time and effort. But how do you design a good cultural probes set? This paper provides insights about the cultural probes method, based on a structured literature review and two case studies in two different educational institutions in Germany. The resulting insights are summarized in a framework that describes the used elements of the cultural probes kits, their usefulness in terms of the resulting insights, and the required effort to prepare, complete, and evaluate the probes. We believe that the work presented in this paper might help other researchers to design better cultural probes sets to use for their own research.

Keywords: Cultural Probes, Case Study, Framework, Design Research, Literature Review

1. Introduction

Cultural probes have become a common method in design research to gather qualitative data based on participatory user self-documentation. This method was first introduced by Gaver et al. [3], and since then, many researchers make use of it. Cultural Probes are a collection of tools (in the following referred to as "items"), 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 resulting qualitative data can afterwards be evaluated by the researchers. 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.

There are many scientific publications that describe cultural probes as part of a research design or a case study (see section 3)—however, not much literature has been published about the method itself. This paper tries to fill this gap. After explaining the used methodology of the paper in Section 2, we provide a structured literature review about cultural probes (Section 3), followed by a description of our own research project that we conducted using cultural probes. In Section 4, we describe the methodology we used to gather insights about the usefulness of the cultural probes method: a survey among the participants. The main part of this paper—Section 5—provides a classification of different cultural probe items, as well as the functions these might have, based on the analyzed literature and our own case study. Section 6 summarizes the results in a framework of cultural probes items, comparing the usefulness of each item, opposed to the required effort for creating, completing, and evaluating it.

We conclude by summarizing our insights (Section 7). We believe that the work presented in this paper might help researchers to better understand the cultural probes method and to design cultural probes kits according to their own research requirements.

2. Methodology

To better understand the cultural probes method and the usefulness and challenges of typical cultural probes items, we used the following methodology: First, we conducted a structured literature review. Second, we analyzed two case studies in two different educational institutions in Germany, in which the cultural probes method was involved. Following Yin's Case Study Methodology [15], we based our case study on the following data sources: 1) direct observations and self experience, 2) follow-up surveys withthe participants, 3) documents (collected data), and 4) the aretefacts (resulting the probes completed by the participants).

After the participants completed the task to fill the cultural probes box with their own documentation, we sent them an online questionnaire to get feedback on their impressions of the whole assignment and the design of the box and the items and tasks. The questionnaire consisted of 5 major sections: The first section dealt with the required effort. We asked how much time they spent on completing the probes, if they would have preferred to have more time overall than the allotted 2 weeks, and whether they completed the probes in one single act or in several smaller parts. In the second section we asked about the single sub-tasks; we asked which task was the most and which the least interesting for them, and why. Also we wanted to know how time-consuming and complex they found the respective tasks, and how much surprising insights they gained from working on the task. For each sub-tasks we also provided the possibility to give further feedback. The third section of questions was regarding the box itself, how practicable, inspiring or limiting they found it. Also, we asked for feedback about the motivational items and the instruction page. The fourth set of questions was about the comprehensiveness of the tasks. We asked whether one or more of the tasks were not comprehensible or difficult to interpret. And finally, in the last section, we asked for general feedback, criticism and suggestions for improvement. From 18 participants we got a response from 12 (response rate 66%).

The resulting insights from the literature review can be found in section 3; the description of the case study is presented in section 4; and the results from the case study are summarized in Section 5—the suggested framework of cultural probes items.

3. Literature Review

Since the first publication about cultural probes by Gaver at al. [3], there is interest in science and practice for using this method to gather qualitative data. A structured review of literature is needed in order to identify the current state of the art of the cultural probes research methods. The flowchart in Figure 1 shows a visual representation of the search process. For the literature review the Scopus database has been used because of its high coverage rate. The search query "'cultural probes' OR 'cultural probe'" was used. Scopus found 93 potentially relevant papers with this search term. These were then selected based on relevance by looking at title and abstract. 34 studies remained after these primary selection criteria. This amount was increased by 4 after performing a forward and backward search. The papers were read and checked for relevance. Papers that only use

cultural probes without discussing methodological issues were discarded. After the final selection, 12 studies were analyzed regarding the reported challenges and opportunities from the methodological point of view (see Table 1.)
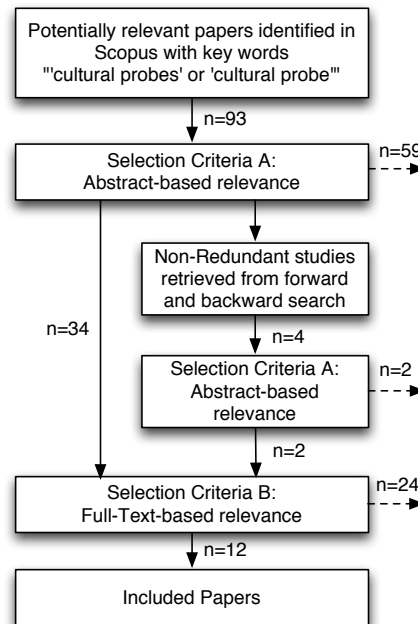

Figure.1 Structured literature review

Most of the analyzed papers use cultural probes as a method for information gathering or as a creativity technique. Some criticize the inherent risk of "discount ethnography" with a reduced interaction between researchers and users. None of them, however, was providing a framework describing the challenges and opportunities when designing a cultural probes set. This paper tries to fill this gap.

Table 1. Summary of analyzed papers

Paper	Opportunities	Challenges
[2]	Material form Stimulate discussions with users Playfulness Provocative nature	Not using subversive and experimental items; Lack of description of the development of probes and the process from probes to design; Not acknowledging uncertainty and ambiguity of probe results (narrow meanings, one correct interpretation)
[14]	Facilitate communication Develop deeper understanding	Some elderlies didn't use probes because of health problems (pen holding), not enough time or energy, illness, or life events
[7]	Collaborative work Interact with users Inspire design	Risk of "discount ethnography"; Substitute time observing and communicating with people with time analyzing probe data
[11]	Provoke inspirational responses; Closeness to subjects; Empathy	No guarantee for a "hit" with the participants Time for creating a good probe; Time for interpreting rich data
[8]	Gathering contextual knowledge Access to sensitive domains	Information vs. Inspiration
[9]	Concrete examples of work routines	Usage of probe too time consuming and too difficult for business participants; Participants saw probe as another "job" to do, not a possibility to collaborate
[13]	Foster creativity Triggered conversations	Information vs. Inspiration; Subjectivity vs. Generality
[1]	Revealed contradictions	One item (Portfolio definitions) did not produce insight

	Participants found it fun and were engaged; Usable for sensitive topics Created holistic understanding	
[6]	Useful for the ''fuzzy front end of design''; Access to people's lives in an unobtrusive way; Provide inspiration	Analyzing different items of the box independently and not in the context of the whole box
[5]	Capture artifacts; Making the invisible visible; Participant as expert; Enable dialogue and conversation; Inspiration, provocation, engender interpretation, use uncertainty	Probes as Realization vs. Probes as Disruption
[10]	Probes are useful for "user personality", "product meaning", and "environment"	Probes are not so useful for "appearance", "user interface", "interaction", and "product novelty"
[4]	Values uncertainty and ambiguity Embrace subjectivity Rich multilayered stories Absurd and provocation questions	Hard to interpret; Relationships between probes and designs complex and difficult to trace; Asking in a way that gives you already answers that you know Averaging answers; Avoiding contact with participants Seeking for justification limits imaginative story-telling

4. Case Description (Creative Space in Design Education)

Before presenting the suggested classification and framework of cultural probes items in the next section, we describe our case study that was used as a basis to develop the aforementioned framework. To explore the relationship between creativity and space and to gather qualitative data in this field we designed a set of cultural probes. Our aim was to collect examples for stimulating, as well as disruptive spatial elements and situations, information about the main activities, functions and the perceptions of the different types of space, as well as evidence about how space influences creativity in the different phases of the working process. These probes we assigned to nine selected design students within the Anhalt University of Applied Sciences in Dessau, as well as to nine students from the HPI School of Design Thinking in Potsdam. The participants were chosen to represent a broad range of different students and were asked to work with the given material over a period of two (Dessau) respectively three weeks (Potsdam). Within the given timeframe it was up to the participants to work on the probes all at once ore continuously in several stages. The probes set consisted of a DIN A4 cardboard-box filled with following items:

- A general instruction explaining how to use and what to do with the different items
- A single use camera with 27 pictures for the students in Dessau. The participants form Potsdam had to user their own digital camera to take as well a maximum of 27 pictures, which should be burned on cd afterwards.
- A cardboard frame and an arrow could be used to highlight important aspects within the photographed motifs.
- A campus map and several floor plans of some relevant buildings.
- Sticky dots with icons and numbers to indicate positive and negative spaces on these maps and floor plans.
- A list to capture additional information and descriptions about the indicated and pictured spaces
- 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.

- A 'postcard to grandma' on which the participants were supposed to visualize their perfect (imaginary) creative workspace.

- A blank template of a journey map for one arbitrarily selected project chosen by the participants, which should show the process of that idea in eight steps, regarding the frequented locations.

- 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.

- A bar of chocolate for a creative break. On the back of the wrappings we provided questions about the qualities of the particular space the participants were in, when consuming it.

- Three pens (red, green, and black) to use for filling out the maps and diaries.

- A blank CD for the pictures and/or additional digital files.

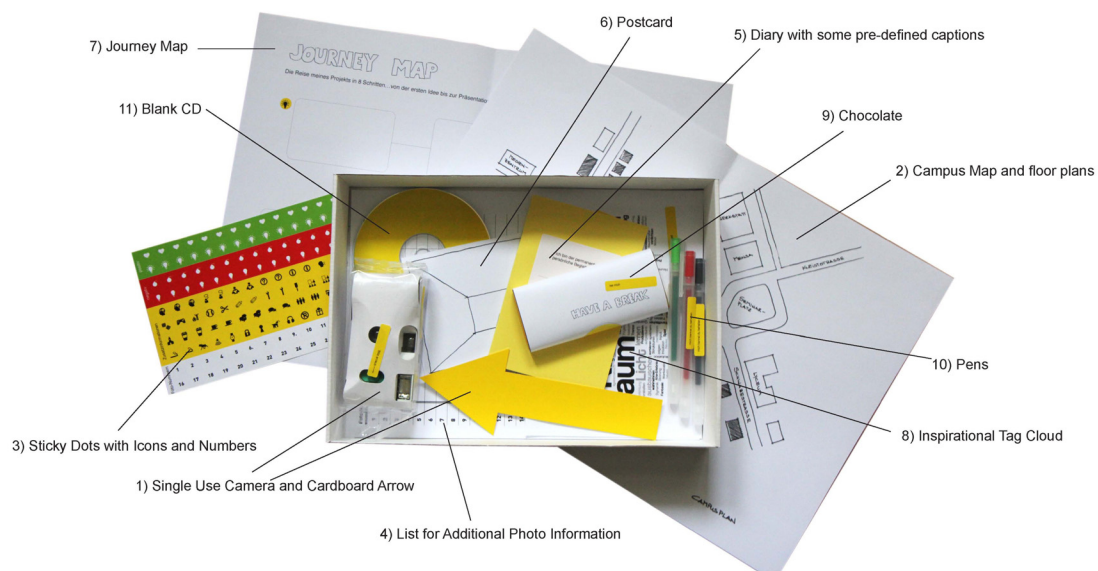See Fig. 2 for an overview of the box. Table 2 shows additional pictures of each individual item.

Figure.2 Contents of the cultural probes box from the case studies

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). That information should also be illustrated accordingly.

For evaluating the collected insights, all the relevant source material was analysed by three researchers (see Fig. 3). 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. Upcoming further Questions were clarified in follow up interviews. 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). Out of this material we could identify five different types of creative spaces as well as five spatial functions, which were published in a different paper [12].

Figure.3 Transcribing, color-coding, and clustering of the collected data

5. Classification of Cultural Probes Items

When designing a cultural probes set, the question arises, what kind of items (= tools, materials, tasks, or other elements) to include in the set. Based on our own experiences with the aforementioned case study, as well as based on our literature review, we developed a list of typical cultural probes items, along with related functions such an item might serve.

5.1 Typical cultural probes items (categories)

In the following, we describe different types (categories) of typical items that can be part of a cultural probes set. We focused on such items that we used in our own case, or that were mentioned in the analyzed literature.

The Wrapping: All items of a cultural probe set need to be stored in some kind of case. This could be a box, a bag, or any other form of packaging.

Diary: A diary is a very common cultural probes item (most of the analyzed literature made use of this). Usually this is a blank book that the participants fill with their observations or ideas, or it can have pre-defined captions or other templates to guide and structure the user's input. It can either be a chronological report, or it can contain instructions what to fill in, or it can be completely empty to give the users the space to express their own observations and thoughts.

Maps: Maps provide a (mostly realistic) structure of a given space, e.g. a floor plan of a building or a geographic map. Participants can either record their observations or own activities within these maps, or they can fill it with visionary ideas.

Frameworks: Frameworks provide an abstract structure for different purposes that the participants fill with their own ideas or observations. Frameworks can be time-related, (such as process maps, schedules, Gantt charts, user journey maps), they can be value-oriented (such as 2-by-2 axis maps, Venn diagrams, bulls-eye maps), or they can be abstract mappings (such as mind maps, concept maps, or postcards to fill out). The results depend highly on the design of the provided structure.

Photo/Video Documentation: This is also very typical for cultural probes. Provide the participants with a photo or video camera and ask them to record or photograph specific places or situations related to the research. These tools usually do not work alone—add some instructions how to use them, what kind of pictures to take and how to store and deliver them.

3d Tools and Materials: Provide some basic materials for the participants to play with, such as clay, cardboard, or Lego bricks. You can even provide 3-dimensional objects for them to work with, for example (voodoo) puppets. People usually like to build things, and this might result in some interesting insights.

Random Probes: Sometimes it might be interesting not to tell the participants exactly where and when to do their documentation, and also to not let them decide themselves what to document and when, but to send them randomly or unexpected messages with instructions, instead, in order to catch them in situations you did not think of before.

Surveys or Questionnaires: Although cultural probes are mainly targeting at qualitative, rich data, it is possible to add little questionnaires and surveys as part of the set.

Gifts: Since the participants are supposed to invest quite some time for completing the tasks, it is a good idea to include some kind of gift as a reward. Also, the more effort you put into preparing the probes set, the more effort the participants will invest for completing it. Therefore, some little extras to make the whole package more exciting, surprising, and fun, will help motivate the participants.

Supporting Material: These items are not exactly part of the research, but might be necessary to make the work for the participants more comfortable. Examples are pens to write with or arrows and frames to highlight specific aspects in the photographed motif. Also props of any kind can be considered supporting material, since their main purpose is to add to the overall atmosphere or 'story' of the cultural probes set.

5.2 Functions of cultural probes items

We suggest the following list of functions to consider when developing the contents of a cultural probes set. These functions are determined by the purpose and the desired result of the item or task, respectively.

Documentary: One of the main purposes of cultural probes is to have people document their observations or activities. Cultural probes items can support or initiate the documentation process of the participants. Such items provide the possibility to capture, store and display the collected data. Example: provided photo camera.

Visionary: Additionally or alternatively to the documentary function, it might be interesting to learn about the participants' visions, emotions, wishes, or ideas. An item can ignite such visionary output. Example: Postcard to grandma.

Inspirational: Cultural probes items can have the purpose to inspire the participants, and to give them some hints about what to do, where to look and what to deliver. This can either be informative or atmospheric. Sometimes a few props add to the overall spirit of your research project, which makes it easier for the participants to dive into the context. Example: Tag Cloud with phrases.

Motivational: The motivation of the participants is crucial. They are expected to spend a lot of time and effort to process the tasks, and this might need a little reward. Consider adding some items that might help to engage people in the project. Example: Bar of chocolate.

Practical: Some items might have just practical functions. Example: Pens to write with, or the box that is just a container for all the other items.

Instructive: Some items serve mainly as an explanation about how to use the cultural probes. It is inherent in the concept of cultural probes, that participants complete them alone, without the possibility to ask the researcher in case that there are questions arising. Tasks need to be self-explaining, or if they are not, some instructional items might help. Example: Manual how to use the box.

It might be helpful to combine several functions in one item. For example, in our above-mentioned case study, we provided a chocolate as a motivational item, but in the wrapping of the chocolate we hid a form with some questionnaire. Such surprising and unexpected tasks make it more interesting for the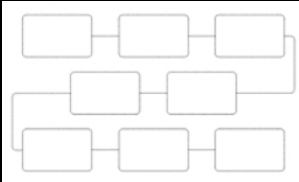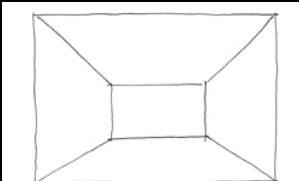 participants to process them, and at the same time it adds some randomization factor to the task, because it reaches the participants in unexpected situations. Or the pens, included for practical reasons, were a gift to keep after completing the probes.

5.3 Examples of cultural probes items (from our case studies)

To illustrate possible applications of cultural probes items according to specific purposes, we describe the items from our before-mentioned case studies. We provided one or more items for each category (except for the 3-dimensional task). Table 2 shows an overview of the used items, the related functions (sometimes more than one), a picture of the item, and some additional comments about occurring problems or general insights and feedback from the follow-up surveys.

Table 2. Examples of cultural probes items and related functions (based on our case study)

Item	Category	Function	Picture	Comments
Box	Wrapping	Practical		A4 cardboard box; intended to be used as a writing board/surface; problem: whole box too large to carry
Sketchbook	Diary	Documentary, Visionary		Favorite task of the participants; possibility to express freely
Site and Floorplans	Maps	Documentary		Favorite task of the participants; interesting self-reflection insights
Journey Map	Frameworks	Documentary		Least favorite task for many participants; exercise not clear to everybody
Postcard to Grandma	Frameworks	Visionary		"Grandma" metaphor not clear to everybody; limited space is a challenge
Disposable Camera	Photo/Video Documentation	Documentary		Analogue style has some charm, easy to use, limited amount of pictures is good, but lack of photo quality

Photo List	Photo/Video Documentation	Documentary		List form not inspiring enough; participants' hand writing was very hard to read
Stickers	Photo/Video Documentation	Documentary, Inspirational		Difficult to produce, but very positive in using them (fun and inspiring)
Text message	Random Probes	Documentary	_Please fill pages 4+5 of your diary now. Where are you? What are you doing?	Randomly sent task; not completed by everybody due to inaccessibility of diary
Chocolate	Random Probes & Surveys & Gifts	Motivational, Documentary		Perceived very positively, nice surprise
Instruction	Supporting Material	Instructive		Provided in addition to verbal explanation of tasks in beginning; add contact address for questions
Tag Cloud	Supporting Material	Inspirational		Some participants cut out phrases to use in diary, or marked important phrases in green and red (positive/negative)
Frame & Arrow	Supporting Material	Practical, Documentary		Good to highlight specific areas in the photograph; did not work well with the flashlight of disposable cameras
Blank CD	Supporting Material	Practical, Documentary		Was filled either with digital versions of the photos, or in some cases with acoustic files (music) for a creative atmosphere
Pens	Supporting Material & Gifts	Practical, Motivational		Provided colors limited the visualization style; either provide pens with more different colors or none at all

6. Framework of Cultural Probes Items and their Usefulness

The main contribution of this paper is the following framework, comparing the required effort for preparing, completing, and evaluating the different cultural probes items from our study with their respective outcome (their research insight). These values were gathered by feedback from the participants of the probes (how much time did they spent on each task, and how much insights did they gain when working on the probes (=completing them). The researchers, on the other hand, provided feedback about the required effort for making the probes (=preparing them), and evaluating the completed probes. (The surveys are available upon request.)

6.1 General feedback on the cultural probes items (Survey Results)

Based on the follow-up surveys with the participants we were able to derive some interesting insights about the users' perspective when completing the cultural probes. From the 18 total of participants 12 answered our questionnaire. Within the two weeks of time given, most students spent 5–8 hours or less to work on the probes (9 responses), which was far less than we expected. Only one person worked for more than 20 hours on the tasks, which was what we had scheduled. Most of them found the 2 weeks of allocated time appropriate for the tasks (7 responses), while the minor part wished for one week of more time (5 responses). Nobody needed more time than that. The most interesting tasks for the participants were the diary (4 responses) and the photo–mapping assignment (4 responses). The reasons for these choices were described as the freedom of the diary with the inspiring captions, and on the other hand the evoked insights while documenting the environment.

The answers for the least interesting task were distributed evenly among the Journey Map, the postcard to grandma, and the photo-mapping (all 3 responses). The reasons here were the following: The photo-mapping was limiting on the one hand (difficulty to reduce the message to one picture), and on the other hand the complexity of the task (having to take pictures, allocate them on a map, put stickers, and describe everything on a list seems to be too much). The Journey Map and the postcard were difficult to understand. The Journey Map would have probably needed more explanation, and some participants were not familiar with the concept of the 'postcard to grandma' (which is a metaphor to describe something in a very simple way); some of the participants were thinking about their real grandma. In general, the whole assignment was perceived very positively. The participants enjoyed working on the cultural probes set and emphasized the motivating design of the set, as well as the unexpected new perspective they got because of the self-observations and -documentations.

Some suggestions arose, such as providing some kind of time schedule about which task to complete when, in order not to spend too much time on one task, or to skip the disposable camera, since most people had a smartphone, today. Some participants suggested that some sort of teamwork would be interesting, to discuss the tasks with others.

6.2 Framework of usefulness and required effort for the cultural probes items

Table 3 shows an overview of the results of the two surveys with the participants and the researchers of the case study, in which we asked for the spent time and effort, as well as the gained insights from each task. Interesting here is mainly the difference between effort and gained insights. For example, some items were not very difficult and time consuming to prepare and to complete, thus resulted in a remarkable insight for both, participants and researchers, such as the text message, the chocolate questionnaire, and also the diary. Others that required a lot of effort in preparation and completion resulted in the highest rating of insights, such as the photo-map-documentation. The least impact in terms of the gained insights resulted from the Journey Map and the

postcard. However, these were also among the least complicated to prepare. Surprising was that apparently the effort for the researchers for preparing and evaluating the cultural probes was much higher (total of 40 hours for preparation, 16–18 hours for evaluation) than the time the participants spent on completing the probes (most of them spent 5-8 hours, some even less).

Table 3. Framework of the required effort and usefulness of the cultural probes items from our study (scale range between + and +++++; (+) meaning a half value)

Item	Effort to prepare	Effort to complete	Effort to Evaluate	Insight for participant	Insight for researcher	General comments
Diary	++	+++	+++(+)	++++	++++(+)	Visionary results, like a creativity technique
Journey Map	+	++	++(+)	++	+(+)	Results more illustrative, not informative, task not well understood
Postcard to Grandma	+	++	++	+++	++	Surprising in a negative sense (very similar, conservative results)
Photos + Map Documentation	++++(+)	++++	++++	++++	++++	Best results regarding the research question
Text Message	+	++	+++	+++	+++	Timing is crucial; some were not able to fulfill the task at that particular moment
Chocolate Questionnaire	+(+)	+	+(+)	+++	+++	Closed questions easy to evaluate, random factor results in surprising insights
The Box	+	n.a.	n.a.	n.a.	n.a.	Too big to carry around, nicely designed though
The whole set incl. items	+++++	++	++++	n.a.	n.a.	see conclusion

7. Insights and Conclusion

This paper presents an extensive look at the cultural probes research method from different perspectives: First, we conducted a structured literature review about cultural probes and analysed the relevant articles, second we conducted two case studies that made use of the cultural probes method, and analysed the probes items from the participants and the researchers view. The results were summarized in a framework comparing the effort for preparing, completing and evaluating a probe item, with the respective impact in terms of the gained insights from each item.

Overall, cultural probes seem to be a very helpful research tool that produces a lot of rich, qualitative data. It is important to understand, that the method is focusing on the inside view of the analysed context; the data is gathered by people who are usually involved in the topic and an objective outside perspective is mostly missing. However, therefore the method allows more personal research than other qualitative research methods, such as interviews or observations, since the participants complete them in privacy. This, on the other hand, requires the items and tasks to be self-explaining or provided with a good instruction. Follow-up interviews with the participants are very helpful to clear upcoming questions and avoid misinterpretations.

The preparation and evaluation of a good probe requires a lot of time and effort by the researchers—however, completing the tasks by the participants was far less time consuming than we had expected. When selecting the participants it is important to have a broad range of diverse people (e.g. friends who complete the tasks together tend to come up with very similar results). Prior-knowledge of participants is crucial (e.g. digital camera cannot be assumed with elderly people). Participants should have an own intrinsic interest to participate. If they are not really interested and need to be convinced, the results will be poor. The method is also working as a creativity technique, not only for research (e.g. the visionary items, such as the diary, produced inspiring triggers for creative ideas).

The main contribution of this paper is a framework of cultural probes items with their respective capabilities and required efforts to produce, complete, and evaluate. We believe that this framework will help researchers to better understand the working mechanisms of cultural probes items, and to improve the designs of their cultural probe sets. Of course, the results from the survey are highly individual and based on the specific design of our probes items—a different design of a probe item might produce different results. Also, the results might be special for the context of our study (creative workspaces). However, we believe that the insights from our study can be transferred to other contexts, and that researchers could adapt our insights to the specific requirements of their research.

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