A REFLEXIVE AND INTERACTIVE APPROACH ON NOVICE-BASED DATA COLLECTION TO INVESTIGATE INFORMATION INFRASTRUCTURE (II)

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A REFLEXIVE AND INTERACTIVE APPROACH ON NOVICE-BASED DATA COLLECTION TO INVESTIGATE INFORMATION INFRASTRUCTURE (II)

Complete Research

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Abstract

From the practice lens the use of artefacts is subject to implicit logic, tacit know-how, and embodied practical sense and is constantly negotiated in the context of performance and within a constellation of practices. We argue that this theoretical approach provides useful assumptions to study Information Infrastructure (II) beyond the conventional understanding of II as “tubes and wires”. Bringing practices into perspective we aim at better understanding the unexpected outcome of II development projects in healthcare. Methodically, this research requires a strategy to trap the opacity of practice. Being an expert transcends technical rationality and is built up from practice which tends to be tacit. Infrastructure is embedded into opaque work practices and transparent to use. Taking this methodical problem into account we suggest studying practices by novice practitioners as they are not yet “practice blind”. By diary writing they contribute to data collection. This idea allows analysing practices ‘from inside’, however puts the researcher in a novel position and bears methodical challenges. By suggesting a reflexive and interactive methodological approach we aim at contributing to practice-based research methods. In this paper we discuss our approach and results based on a first run with pharmacists in practical training.

Keywords: Practice Lens, Information Infrastructure, Practice Probes, Practice-based Learning, Reflexive Novice Diaries, Novice-based Data Collection, Interactive Approach.
1 Introduction

The ‘practice turn’ has gained increasing attention in several distinct scholarly traditions (Gherardi, 2012; Nicolini, 2013; Reckwitz, 2002, 2003; Schatzki et al., 2001). Thereby, the central role of everyday practices has been foregrounded. While some research streams explicitly embrace the practice ‘label’, others contribute by practice-oriented research to the unfolding ground of theoretical assumptions and vocabulary (Nicolini, 2013). Authors contributing to the discussion of practice approaches unanimously agree that there is no ‘grand’ practice theory but family resemblance of several approaches with similarities and dissimilarities (e.g. Schatzki et al, 2001).

In information systems research authors such as Orlikowski (1992, 2000) and Suchman (1999) explicitly advocated studying technology as practice and suggested an ‘alternative’ approach that posits the constitutive entanglement of the social and the material in everyday life. Accordingly, technology is characterized as creator of conditions for human encounters with technology which vice versa is configured by users applying the technology in a particular historical and social context (Greenhalgh and Stones, 2010; Monteiro et al., 2012). In information infrastructure (II) research several authors extended the conventional understanding of II as “tubes and wires” by bringing the “work of infrastructure and its maintenance” into perspective (Bowker, 1994; Hanseth et al., 1996; Shapin, 1989; Star, 1991) and by conceiving II as something relative to organizational practices (Star and Bowker, 2002; Star and Ruhleder, 1996). Browker et al. (2010) define II as being (1) ‘large’ spanning time and space; and (2) ‘small’ coming in contact with everyday practices. Analytically, this entails a shift from studying infrastructural components to infrastructural relations and distributed technical, social, and institutional activities embedded in work practices (Bowker, 1994; Bowker et al., 2010). Thus, a practice-based approach seems promising to study II.

In this paper we want to address two major methodical problems that emerge when infrastructure is studied from a practice lens. Star and Bowker (2002, p. 152) conceive II as something that “was once the subject of design sunk into infrastructure as people began to embed it into their practices”. According to Star and Ruhleder (1996) infrastructure is transparent to use; it only becomes visible upon breakdown. Practitioners find it difficult to recognize and explicate something that is ready-at-hand. The second problem refers to the opacity of practice. Drawing on Bourdieu’s (1990) ‘docta ignorantia’ and Polanyi’s (1966) ‘tacit knowledge’ Gherardi (2012) underlines that the mode of practical know-how is characterized by being unaware of its own principles. The implicit logic, the tacit know-how, and the embodied practical sense are opaque for practitioners. They are not able to communicate it straightforwardly or to articulate it. Hence, infrastructure is embedded into opaque practices and transparent to use.

Due to these methodical problems, several practice-oriented researchers suggested diverse techniques for rendering explicit what is transparent or disguised and to linguistically express what often does not pass through language (Gherardi, 2012). Arguing from an emic methodological approach, Reimers et al. (2011, 2013) proposed to use novice practitioners as practice probes to study (inter)organizational practices. They argue that, contrary to experts, the novices are actively grappling with learning to perform in the context of practice, and reveal by their learning process unique insights into practice. Novice diaries are regarded as a tool for documenting the learning process and studying practices.

We chose this idea of practice probes to study practices in healthcare. In our research we found that “inserting” practice probes for data collection, puts the researcher in a novel position and bears methodical challenges. In order to ensure data quality, we propose to extend the idea of practice probes by a reflexive and interactive methodological approach. In our research this resulted in reflexive novice diaries, an analytical framework to practice-based learning, and complementary interactive workshops. The latter served as loci for mutual learning between the researchers and novices and among the novices. In this paper we report on a first experimental run in which we tested...
our approach with 3 novices in community pharmacies. By presenting and discussing the results we aim at contributing to the repertory of methodological approaches and methods for practice-based II research. In section 2, we explain the theoretical implications of the ‘practice turn’ for practice-based II research. Subsequently, we contrast different techniques and illuminate their applicability for studying practices. In section 3, we present our methodological approach and the elaborated techniques in more detail. Section 4 introduces the research background. The results are presented in section 5 and discussed in section 6. Finally, in section 7, we draw conclusions from this experience.

2 Challenges for Studying II from a Practice Lens

2.1 Theoretical implications of the ‘practice turn’

In contemporary infrastructure projects, for instance in the healthcare sector, the notion of installed base is easily equated with artefacts or technologies. Thereby, the local practices move in the background as additional contextual factors to be considered. The social and historical situatedness of practices becomes simply a deviation from what is considered the function of a professional’s role. This masks away complexity and allows for engineering infrastructures as large-scale systems. Yet, various studies show that “users” respond to ICT by inventing workarounds, refusing the technology actively, ignoring it if they have an exit option, or employing it for unintended purposes (Aanestad, 2003; Wenger 1998). We believe that a practice lens could help better understand what it means to perform as a pharmacist, a doctor. It could explain some of the challenges these projects are facing.

In this paper we want to restrict our practice approach to study II by emphasizing some of the features of a practice lens: (1) situatedness, (2) interrelatedness, and (3) the entanglement of dualities such as structure and agency, body and mind, subject and objects. Together they provide the theoretical basis for our empirical study of II.

(1) Practice foregrounds the situated activity behind all durable aspects of social life (Nicolini, 2013). From this view, the context is not simply a given external milieu, but a complex and emergent outcome generated and regenerated in the flux between various dualities over time (Greenhalgh and Stones, 2010, p.1286). Referring to the situated aspect, Gherardi (2012) suggests to study practice ‘from inside’ concentrating on “knowing as collective doing” rather than on the “institutionalized doing” characterized as regularity, patterns and more or less shared understanding that allows repetition. Both Gherardi (2012) and Nicolini (2013) point out that describing regularities and patterns might be useful for familiarizing the researcher with the activities of the practitioners, yet studying practice requires to go beyond cataloguing tasks and ‘institutionalized doing’. “Practices are, in fact, meaning-making, identity-forming, and order-producing” (Nicolini, 2013, p. 7). The empirical study of practice must concentrate on the temporality and processuality in which the activity is performed as well as on “the emergent and negotiated order of the action being done” (Gherardi, 2012, p. 161)

(2) Several authors suggested terms such as network (Latour, 2005), texture (Schatzki, 2002; Reckwitz, 2002) or constellation (Wenger, 1998) to emphasize that practices are mutually connected and constitutive of each other. From this point of view, “understanding and representing a practice requires a reiteration of two basic movements: zooming in on the accomplishments of practice, and zooming out of their relationships in space and time” (Nicolini, 2013, p. 16). Connectivity and interactivity are salient aspects of studying practices, yet they increase the complexity of research. Investigating II in healthcare compels to study the interrelatedness of practices as many participants with different professions and multiple types of practices are involved.

(3) One of the main features of practice approaches is the emphasis on know-how, sensible knowledge and the knowledgeable body. Competence in practice is not a collection of rules and facts acquired from books, but involves learning how to act, how to speak, how to feel, what to expect and
what things mean (Nicolini 2013). Practical earning occurs through moments of becoming, coincidental occurrences, affective involvement, everyday narratives, and learning-with-objects (Nicolini, 2013; Sutherland, 2012; Wenger, 1998). Wenger (1998) identifies four components to analyse the becoming of novice practitioners: (1) learning as doing – gaining competence in practice through participation; (2) learning as meaning – acquiring fluency in the concepts of a community; (3) learning as belonging – positioning oneself in a constellation of practices; (4) learning as becoming – transforming the own personal identity. Learning as a socio-materially mediated phenomenon emphasizes that it is intermingled with social, material and discursive activity, body, emotions, artefacts, preoccupations, and habits (Lave and Wenger, 1991; Nicolini, 2013; Wenger, 1998). Hence, being an expert transcends technical rationality and is built up from practice which tends to be tacit (Lave and Wenger, 1991; Polany, 1966; Schön, 1983). This tacit or opaque aspect of practices needs to be accounted for theoretically, but also in terms of an appropriate method.

By studying II as an interrelated phenomenon characterized by the socio-technical, global-local, and bodily-mental entanglement of social, material and discursive activities that are embedded into situated work practices, we expect to better understand the characteristics of II. This may, in the future, allow finding new ways for “designing” II in healthcare.

2.2 Techniques for investigating (inter)organizational practices

Researchers have adopted different philosophical positions that can be reflected in assumptions on (1) the interpretation of reality, (2) the appraisal of the role of the researcher, (3) the way of deriving conclusions from results (generalization, theorization), and (4) the capability or intention of the researched to reveal what is defined as reality (see i.e. Greenhalgh and Stones, 2010). By discussing these aspects in line with different methodical techniques such as interviews, observation, and autoethnography we contrast the applicability of these techniques to study practices.

Due to our theorization of practice as situated activity and as implicit knowing, semi-structured interviews by which the researcher inquires the practitioner by means of preliminary structured questions or based on preconceived concepts are a rather limited tool to study practice. First, the interview situation does not base on a trustful relationship between interviewee and interviewer and might, hence, be subject to political or strategic behaviour of the interviewee (Alvesson, 2003). Second, language does not describe an objective reality; rather it organizes a discourse on truth in a partial manner (Gherardi, 2012). Third, tacit know-how needs to be made visible by turning practice into an epistemic object; “practice never can be apprehended in an unmediated way” (Nicolini, 2009a, p. 4). Forth, bodily knowing eludes straightforward articulation (Gieser, 2008; Zundel, 2013).

In order to encourage a trustful relationship, and to reveal the tacit aspect of practice, ethnographic interview approaches were developed. These approaches base on reciprocal knowledge and a trustful relationship between interviewee and interviewer. The idea is to come closer to the context of practice by discursive work and material activity (Gherardi, 2012; Nicolini, 2009a). One such technique suggested by Graver et al. (1999) are cultural probes, a set of artefacts that facilitates the establishment of a common reference frame for meaning production between researchers and practitioners and motivates a richer representation of experiences of the practitioners by which taken-for-granted aspects of the practice might be revealed. Another qualitative interview technique for eliciting know-how was suggested by Gherardi (1990) and Nicolini (2009a). The interview with the double is a technique of projective interviewing on the principle of social interaction. It requires the interviewee to imagine she/he will be replaced at their job by the interviewer. The interviewee is then asked to give the interviewer the necessary instructions (Nicolini, 2009a).

Any interview technique bases on the use of explicit language to describe work practices, and on cognitive and discursive accounts ignoring the complexity of practice (Gherardi, 2012). Practices are not only taken for granted but also embodied. Practitioners are often not sufficiently aware of tacit
aspects or are even not able to explicitly express them. As Polany (1966, p.4) wrote “we can know more than we can tell”. Ethnographic observation methods are therefore regarded as a complementary technique to interview techniques. By having coincidental talks with the practitioners and observing their everyday activities, the researcher aims to discover tacit and embodied aspects.

While rather positivist observational approaches emphasize a linear research process and the necessity of distance to the field (mainly dominant in social studies), interpretivist observational approaches accentuate the *sine qua non* of a holistic research process and the insider perspective in order to allow that situated practices and local know-how open up (Jorgensen, 1989). By the latter approach, the researcher immerses into the field as a novice and participates in everyday life in order to learn by doing and feeling. She/he gives up the control over the setting of participant observation and becomes subject to social interaction and control (see Malinowski, 1979). As a consequence, reflexivity of the researcher became an indispensable element of qualitative research, and a participatory research relationship is assumed as the bases of research. This shift led to reflexive approaches such as autoethnography, going beyond participant observation which was suspected to provide an outsider’s perspective (cf. Savage, 2000). Autoethnobiographical approaches are understood as a more appropriate methodical way to uncover and illuminate the tacit, subaltern, emotional and relational aspects of organizational practices (Kempster, 2008; Parry and Boyle, 2009). Here, the researcher conceives her/himself preliminary as a novice practitioner learning how to perform a practice and reflecting about the learning process. However, in highly professional fields such as healthcare, the capability of the researcher to undergo a learning process as a physician or a pharmacist is limited due to the highly specialist knowledge and know-how (see Crang and Cook, 2007). As several authors advocate, it is not necessary to learn a profession in order to study practice, yet from an epistemological point of view Reimers et al. (2013) argue that many aspects of a practice are opaque for outsiders unless they become legitimate peripheral participants. They define a legitimate peripheral participant as “someone who is not primarily a practitioner but their engagement with the practice is legitimised” (Reimers et al., 2011, p. 412), e.g. a novice practitioner. Inspired by Wenger (2002) they suggest studying the process of becoming a competent practitioner. By this approach, novice practitioners document their becoming in a diary. Contrary to experts, novices do not yet take their work for granted (Suchman, 1987). Striving to become competent, they continuously encounter disturbances and contingencies in practice and attempt to find a legitimised way to solve the problematic situation. In addition, they stay detached before “things” and wonder how they might “matter” (see Dreyfus, 1991 referring to Heidegger, 1962). They enter a novel context and reveal through learning important aspects of the same practice (Reimers et al., 2013).

Since we aim to study practices in healthcare ‘from inside’ and being aware of the opacity problem, we decided to use practice probes who document their learning process in diaries. Yet, inserting practice probes for data collection puts the researcher into a novel position. She/he is positioned in some distance to the field and is, hence, depended on the quality of the novice diaries. This entails two challenges: (1) novices must have writing and reflecting skills for going beyond mere description of tasks; (2) novice diaries provide a particular view, and might be fragmentary. Bringing them into perspective and using them as a basis for mutual learning among novices and between researchers and novices finally allows immersing into practice. Faced with these challenges, we developed a reflexive and interactive approach to the idea of practice probes.

### 3 Making Learning in Practice Visible for Research

In this section we explain our methodological approach to practice probes. In contrast to Reimers et al. (2011) who advocate that “it is important that the researcher is not involved in the process of diary writing in order to prevent the intern becoming simply a medium through which the researcher remotely collects data or asks questions” (p. 415), we found that the data collected by practice probes was rather poor in case of novices were not equipped with some analytical and methodical tools and
accompanied through the research process. Therefore, we decided to provide the novices with a framework for better understanding reflexive writing (section 3.1) and with an analytical lens for becoming aware of important aspects of practice-based learning (section 3.2). In addition, we organized workshops to manage the research process and to enhance mutual learning (section 3.3).

3.1 Reflexive diaries – keeping track of individual learning trajectories

Learning in practice unfolds from everyday engagement with the surroundings and is conceived as a tacit conversation with experiences and situations (Reynold, 1998 in Zundel, 2013). Using the learning experience for research requires foremost a way to trap and visualize such situations. Contrary to explicit aspects of knowledge, bodily knowing and the meaningful of practice elude straightforward communication and articulation (Reckwitz, 2003; Zundel, 2013). It is the indirect approach of narrative reflexion that provides a potentially valuable data source for the researcher. It allows the novice to reconsider earlier assumptions, and enables the researcher to get closer to practice. The reflexive novice diary is an instrument to document the learning process and grasp the meaning of practice. Reflexive writing requires the author to elaborate on his/her perception of the world and to tell the audience a story about how “things matter” to him/her. Descriptive writing on the other hand is valuable to illustrate the surroundings. Yet, it is reflexion that provides the means to unravel the meaning of relationships in which the practitioner is embedded, the transformation process to become a participant of the practice.

For tracking these moments in the learning process, and for giving the novices an understanding of what reflexion means, we employed a framework of four levels of reflexion. This framework is a simplified version of Hatton and Smith (1995) and was proposed by Moon (1999) for coaching students in reflexive writing. The first level encompasses descriptive writing. On this level, the context and events are described in detail, but it involves no discussion beyond description. Descriptive reflection is the second level. Here the reflexive learner contemplates actions and alternative viewpoints. She/he relates the doing to the context and reflects on her/his participation in a web of meaningful relationships. On this level, narratives unfold, telling stories about how action was experienced and viewpoints incorporated. On the third level, the author steps back in order to reflect in a dialogic way. Thereby, he investigates the quality of judgements and possible alternatives, explanations and hypotheses. By doing so, she/he explores the self in the practice. On this level, reflection exceeds the narratives of experience by analytically linking different viewpoints. Thereby, a transformation of the self may emerge. On the last level, critical reflection sensitizes the learner to be aware that the same actions and events may be judged differently in different contexts. The differences are due to diverse historical and socio-political contexts. By contrasting variations in practice and viewpoints of other actors, the reflexive learner explores her/his practice in the constellation of practices and gains novel insights.

3.2 Sensitizing novices for practice-based learning

Reflexive writing is a helpful instrument for documenting the mental conversation with experiences. However, as we intend to use the novice diaries for research, the mental conversation has to be guided to a certain extent, but such guidance must be careful to not put the novices in a straitjacket. It is rather a supportive tool to provide the novice with an understanding of what the researcher is interested in and to sensitize them for their own learning process. Accordingly, we developed an analytical framework of practice-based learning which we explain in more detail in the following.

According to our understanding of practice in subsection 2.1, we adopted a holistic framework encompassing mental, sensory, and affective dimensions. We asked the novices to pay attention to what they observe, to what they physically and affectively perceive, and how they encounter professional knowledge. In addition, everyday situation in which learning happen
participation was outlined. Such situations encompass the encounter with difficulties, mistakes, lacking understanding, discovery of novel things or aberrations, wondering, success in overcoming problems, or innovations. As learning is a social phenomenon where meaning emerges and is communicated in doing, the students were sensitized to pay attention to cues such as misunderstandings, hints, remarks, comments, explanations, advices, warnings, critique, scolding, praise, and common problem-solving. In doing so, we agree with Nicolini (2013), referring to Wittgenstein (1969), that it is not “formal instruction through which a practice is grasped, but through hints, tips, and examples: it must speak for itself” (Nicolini 2013, p. 39).

3.3 Novice workshops – authenticity, validity and mutual learning

In addition to the instrument of reflexive novice diaries we organized workshops as a complementary methodical means. As novice diaries always represent individual views and are fragmentary, discussions on the basis of the diaries were considered as contributing to the authenticity and validity of data. Additionally, the workshops served as a platform to manage the research process and to enable mutual learning among novices and between researchers and novices through interaction and dialogue:
(1) The analytical and methodical tools were discussed and adjusted in order to support as much as possible the learning experience of the novices, and to ensure by this the authenticity of collected data.
(2) The novice diaries were brought into perspective in order to allow insights emerging beyond diary writing.

4 Novice-based Data Collection in Healthcare

The motivation for our method was to better understand the way physicians, pharmacists, and nurses work and cooperate with other actors. For the initial test of our method we focused exclusively on novice practitioners in community pharmacies.

4.1 Pharmacists in Practical Training (PhiP)

The German Pharmacy Practice Act requires students to complete their education after passing the second state examination by a 12 month period of practical training. At least six months of this so-called “practical year” have to be spent in community pharmacies while the rest is available for working in industry, hospitals or forensics. By the time PhiP assume their apprenticeship in the pharmacy they had extensive training in theoretical aspects of pharmaceuticals (e.g. chemical ingredients, preparation of salves, drug interactions). For many PhiP the practical year introduces them to their future job which requires close interaction with doctors, patients, insurances and wholesalers. While most have done an internship of eight weeks in a community pharmacy during their studies, it is the first time that they assume responsibility for treatments and the dispensing of pharmaceuticals. Directly after the “practical year” the students have to prove their practical and theoretical expertise in the final state examination in order to obtain their license.

4.2 Our research process

For recruiting practice probes we purposefully chose to ask students at the stage of the PhiP as they are involved completely into everyday work. They undergo the practical education that enables them to competently participate in the practice. For finding PhiP candidates, we made contact with the pharmaceutical student representatives and explained them the concept of reflexive novice diaries. Being interested in the idea, they invited us to one of the last lectures where the PhiP candidates were prepared for the practical year. During a short presentation about the research project and our background, we explained their expected contribution: one kick-off workshop, keeping of a daily diary
over 4+2 weeks, and one final workshop. Their participation was voluntary and we promised a small amount of money as a financial compensation. Soon afterwards three pharmaceutical students volunteered to keep a reflexive novice diary during their apprenticeship in the community pharmacy. We provided them with material they could use to explain the project to pharmacy owners. The decision to disclose their participation was left to the discretion of the individual practice probes.

Ahead of the “practical year” we organized a kick-off workshop in order to introduce the students to our project. By presenting them the four levels of reflection and conducting exercises we wanted to sensitize them to the requirements of reflexive writing. In addition, we explained the concept of practice-based learning and provided examples. With these tools we intended to increase the attention for situations in which both explicit knowledge transforms and tacit know-how emerges in practice. As a memory-aide we equipped the novices with a catalogue of questions in relation to the several dimensions, various situations, and different social moments of practice-based learning. We conceived this catalogue not as a structuring corset but as a supportive toolkit. Both tools became a common frame of reference for giving the novices regular feedback on the quality of their diary entries. Last but not least, we motivated them to adopt an illustrative attitude trying to imagine themselves as guiding us through their learning experience.

From May 2013 until October 2013, the first run of practice probes was conducted. For the first four weeks of the pharmaceutical apprenticeship, the practice probes made almost daily notes. In the following months, they just added supplementary or new experiences, and for the last two weeks they went through their notes reviewing their learning process in the community pharmacy. In total the diaries of our three practice probes became 60 pages long.

After the first week of the apprenticeship, all practice probes sent their notes to the researchers in order to discuss them, and to get advice on their writing and reflecting skills. The framework for reflexion was used as a common basis for coaching the students to elaborate on their writing style. Advice was provided during the whole period if wished by the novices or necessary due to the quality of diary writing.

After three months, a second workshop took place with the intention to discuss experiences, occurrences and important issues among the novices and between novices and researchers. In this workshop, new insight was obtained and additional issues discovered that complemented the experiences in the reflexive novice diaries. In order to make the students feel at ease, the workshop was not recorded.

A third workshop is planned at the end of the practical year in 2014 in order to present the research results to the students and to get their feedback.

5 Results

This section presents results in respect to the type and quality of data that we were able to collect. By showing a selection of excerpts from the diaries (section 5.1) and by referring to issues shown up in the workshop (section 5.2) different levels of reflexivity come to the fore and can be related to the stages of the novices’ learning processes. Wenger’s (1998) four components to analyse social learning provided us a useful frame for tracing the becoming of the novices: (1) learning as doing – gaining competence in practice through participation; (2) learning as meaning – acquiring fluency in the concepts of a community; (3) learning as belonging – positioning oneself in a constellation of practices; (4) learning as becoming – transforming the own personal identity.

In this paper we do not elaborate on the insights for any particular infrastructure initiative nor aim at a theoretical discussion on practice-based learning. Instead our aim is to report to what extent our methodological approach is capable to study practices on the basis of social learning empirically.
5.1 Learning reflexive diary writing

After the kick-off workshop all our practice probes decided to use electronic means (MS Word, Evernote, OneNote) to document their learning experiences. All of them refrained from entering data during the day. Instead, entries were made after work during the evening. The practice probes spent roughly one week in the field until the feedback meeting took place. By reviewing their entries, we observed that emotions such as nervousness and doubt played a major role in the diary notes. In respect to the descriptive and reflexive quality, two of three cases were not satisfactory in the beginning. Rather they gave the impression of too much self-absorption or were unsubstantial. For instance, new tasks and knowledge were written down by listing singular steps in short note form.

Structuring processes and short notes seem to be important for apprentices as they support memorizing. Although short notes may provide interesting clues, they are not sufficiently narrative to get insight into the context and meaning of practices. During the feedback sessions we probed the participants for the meaning of vague or deficient descriptions and motivated them to reflect more on the context and meaning. The analytical framework of practice-based learning (presented in subsection 3.2) and the framework of the four levels of reflexion (presented in subsection 3.1) proved useful for this purpose. This experience added to our own learning process. We realized that diary writing is even more sophisticated than envisaged and that a common understanding and agreement on reflexive writing as well as the conceptual lens are important. After this first phase, the level of reflectivity in the diaries increased. Emotions were mostly mentioned in regard to the relative level of certainty and confidence in certain tasks.

- Learning as doing and learning as meaning

Particularly in cases in which the researcher is not present in the field, detailed description is necessary for gaining insight from afar. Yet, this is only useful to familiarize the researcher with the context and with the activities being performed. In order to achieve a holistic understanding of a practice it is necessary to make visible what “matters” to the practitioners and how the various components of practice are meaningfully connected. On this matter, the reflexive accounts of the novices’ experiences provided rich insights into practice. The following note (Note 1) shows a reflexive description that immerges more deeply into the context. It does so by bringing into the light i.e. (1) the different “character” of artefacts such as computers, order sheets, and drugs; (2) the human-human-object interplay such as the bodily mediated conversation between the novice and the customer in respect of the situated order of drugs in the shelf behind-the-counter of the pharmacy. Each pharmacy is “installed” on its own specialism such as homeopathy, dermatology etc., and is oriented towards particular groups of patients such as casual customers versus regular customers of physicians in the vicinity of the pharmacy; (3) the timely interminglement in form of references to past experiences and knowledge being involved in a present discourse about prospective actions.

**Note 1**

**[Week 4]** The operations on the computer are always the same, but the other work processes are different. For example, in City Y I was not told to show the orders to the pharmacist, I just process them. Here I have to ask someone looking over the orders before I can continue the ordering. This is very confusing. The same is true for drugs in the shelves behind-the-counter. In city Y, there are many more and quite different drugs in the shelves behind-the-counter. When I change the pharmacy I first have to remember on whether a particular drug is behind me or if it has to be requested. Sometimes I’m lucky and the customers know better where to find it; then they point at the drug in the shelves or they tell me to fetch it. (Novice A, own translation)

This note demonstrates how social, material and discursive activities, body, artefacts, preoccupations, and habit are intermingled in a web of meaningful relationships (Lave and Wenger, 1991; Wenger, 1998; Nicolini, 2013). The novice finds a way through the working day by encountering local
conditions, remembering recurrent elements, and adjusting to contingencies and new situations. While doing so, she/he is situated in the entanglement of the past, present and future as well as in a broader socio-technical network. According to Gieser (2008), the apprentice undergoes an education of attention by which the perception is fine-tuned through seeing and listening. Guided by verbal command and commentary “novices are instructed to feel this, taste that, or watch out for the other thing” (Ingold, 2000: 22). Customers play an active role in the learning process of the novice who is not yet fluent in the situated order of drugs in the shelf behind-the-counter. This underlines that artefacts are meaningfully arranged in a particular context and organize the novice’s performance. Novices learn in conversation with patients, physicians and other persons and by using artefacts in their surroundings. The ongoing, dynamic learning process unfolds within a person-person-object-relationship where every interaction refers to a wider pattern of connectedness, and at the same time is an opportunity to learn and modify the ongoing practice (Nicolini, 2013; Zundel, 2013).

While tacit know-how showed up indirectly in narratives, observations in respect to explicit knowledge were mentioned directly. Professional knowledge is aligned to particular methods, tools, language, rationality, and rules. In the community pharmacy, the technical rationalities are supplemented with new knowledge closer to the occupation. Soon, the novices realized that drugs are no longer perceived exclusively as composition of active components and filler media, but preliminary as branded products with names that do not correspond to pharmaceutical semantics. In addition, patients asked for over-the-counter products and advice in respect to illnesses such as fungus infections, colds, general pains, which are not learnt at the university (Note 2).

Note 2

[Week 1] Impressive and at the same time very alarming was to see that we have not been taught about such essential “diseases” that are extremely relevant and frequent in practice. I will ask the PTA (pharmaceutical technical assistant) to work with me on important topics. My colleague told me that she learnt it by typing the name of the drug into the computer and reading the information on the virtual package leaflet; by doing so, she prepared herself for patient consultation. (Novice A, own translation)

The novices had to re-learn medication expertise in the occupational context. Here, the knowledge and know-how about drugs and illnesses are related to the practice of physicians, patients, and the industry. In this novel context, they found a new way to establish expertise by becoming attuned to different reference frames, taking part in various discourses and being oriented towards achieving a common understanding of the situation. Within this relatedness, meaning is mutually created by the process of situating information. Hence, knowledeability goes beyond attaining certainty and routinization; it is situative awareness and creativity in meaningful performance.

- Learning as becoming

By the time, the apprentices not only acquired proficiency and confidence in relation to the novel context, they also developed a feeling of occupational belonging by getting related to the things around them. In the beginning, one of the apprentices was not enthusiastic about spending six mandatory months in a community pharmacy. It seemed to be a waste of time to sell drugs when compared to more appropriate fields like research or the pharmaceutical industry. During our test this novice underwent a transformation and found a way to establish connectedness and coherence between personal inclinations and the work in the community pharmacy. The following entry (Note 3) illustrates this process of becoming which is easily traceable since the novice wrote it down in a piecemeal and reflexive way.

Note 3

[Week 5] It is a pity that I get more and more the feeling that the study of pharmacy does not bring me so much for the community pharmacy where I have to deal with work such as making phone calls,
WaWi [materials management], printing prescriptions and entering health insurance numbers instead of being busy with formulas and pharmacology. [Week 8] Since I work in the drug selling area I got a slightly different impression and cannot any more confirm on what I had written so far. Of course, it is not possible to advice patients by referring to the technical and theoretical knowledge learnt at the university, but the more pharmaceutical background information the better for explaining the patient important facts. It is good to see that it is easier for the patient to understand important issues in respect to his medication which hopefully increases the compliance. (Novice B, own translation)

5.2 Novice workshops – learning as belonging

Three months after the beginning of our study we organized a joint workshop serving three major purposes: First, we intended to use it as an opportunity to discuss reflexive diaries as a research instrument. Second, we wanted to facilitate the exchange of experiences by clarifying our own understanding of topics mentioned in the diaries. During the workshop, the dialogue with the novices turned out to provide very valuable, additional insight into topics that remained unaddressed in the diaries. The workshop complemented the diaries substantially. The following important issues turned up:

(1) Our participants perceived the reflexive diaries as having little value for their own learning experience. In addition, one proprietor of a pharmacy conceived the diary as an instrument to gain additional insight into the operation of his employees. This has put the practice probe in a moral dilemma between loyalty to the proprietor, to immediate colleagues, and to the research project. Both occurrences show that practice probes are rather active participants than passive instruments. The workshop was an appropriate platform for discussing and solving problems that we might not have recognized otherwise and which could have endangered the authenticity of data.

(2) One of the diaries referred to a customer loyalty card program. The entry explained that it entitles the patient to financial advantages, and in addition allows the pharmacy to check for drug interactions. For us the information provided in the diary was incomplete. During the workshop this question spawned a general discussion about the bond of trust between patients and pharmacies compared to patients and physicians in regard to medication. It turned out that the customer loyalty card increases the patient’s confidence in the pharmaceutical competence and many patients begin to ask the pharmacists to review their medication management prescribed by the physician.

(3) As researchers we were particularly interested in the relation between the pharmacies and other healthcare professionals. It appeared to us that the entries in the diaries were primarily concerned with the community pharmacist only, although the fourth level of Moon’s (1999) framework on reflexion explicitly calls for critical reflection within the broader context. For our purpose, the entries contained too little reflection on the social and interprofessional constellation of practices. While the researcher is interested in the overall view, the novice is primarily busy with accomplishing his tasks and to catch up knowledge for the final state examination. In this regard the workshop was an indispensable element for adding critical reflection and zooming out on the position of pharmacists in the network of practices. For example, on weekends, the stock of medicines in a pharmacy is managed to reflect the physicians’ prescription habits. Since each physician has a particular habit of prescribing certain drugs, catching up on the working schedule of physicians in a pharmacy’s surrounding allows for customized procurement.

6 Discussion

We started out to devise a method that allows us to get a closer understanding of practice for II research. Our choice of the data collection technique was based on the objective to ensure consistency between the method and our theoretical understanding of practice. By employing the emic research
approach of practice probes, we elaborated on the methodological approach to ensure the quality of data collected by novice practitioners. Ultimately, the theoretical approach and the method should serve our interest in studying II as a relational concept providing useful material to inform infrastructure design in a future step.

Studying practice is a complex operation due to several reasons. First, the practice lens is characterized by diverse theoretical approaches with many similarities but also differences. Therefore, studying practice is a theory-laden operation and requires theoretical clarification. Second, the study of practice needs a methodical strategy to trap practices as they are opaque to practitioners and researchers (Gherardi, 2012). In order to strike a balance between the outside view of pure observer and the blindness of experts, novices are suggested to contribute to the study of practice from the vantage point of legitimate peripheral participation (Reimers et al., 2011, 2013). Referring to this idea we extended the practice probe method by a reflexive and interactive approach and tested it with pharmaceutical students.

The reflexive approach to the novice diaries proved to be useful to trap hidden issues and unexpected relationships. It allowed us to get an in-depth understanding of how things matter to community pharmacies. We were able to trace meaning-making, identity-forming, and order-producing aspects by following the novices in their learning process. However, we also encountered challenges to receive authentic data by reflexive novice diaries. In the beginning, two of the novices started out to write in a self-absorbed style instead of reflecting on their daily practice. In addition, important aspects were overseen or remained unreflected. Third, novices tended to describe tasks factually and in short form rather than reflecting on the learning process. They used the notes as an object-in-practice to remind them on important steps of a task. Such notes are embedded into the novices’ practice and, hence, appear sufficiently complete for them. The researchers, on the contrary, are positioned at some distance to the field and, hence, are depending on the expressiveness, liveliness, and reflexivity of the novices’ descriptions in order to get as much insight into practice as possible. In addition, researchers are rather interested in the meaning-making, identity-forming, and order-producing aspects of practice. Cataloguing what people do is only a necessary starting point, yet not the end (Nicolini, 2013). In this respect the analytical lens on practice-based learning and the four levels of reflexion proved to be very useful. By these means we were able to give the novices an idea of what we were interested in and an orientation on how to document their learning process, yet without putting them in a straitjacket of narrow concepts or making them consequently answering a list of questions. Rather, the researchers provided them a frame for better understanding their own learning process by reflexivity and reflexive writing. While novices are “in practice”, researchers study practice as an epistemic object (Nicolini, 2013). The differing perspectives on practice make it necessary to turn practice into an epistemic object for practice probes.

The efforts to prepare and accompany novices are not to be underestimated. The same is true for the efforts the novices invested. All novices agreed that reflexive writing required too much time without additional value. They struggled to learn how to practice. Thus, the motivation to describe, in the evening, what they have learned seemed limited. By staying in contact with them we were able to provide them with a better understanding of the purpose of reflexive novice diaries, and to learn from their feedback on evolving issues. By doing so, we were able to adjust our methodical tools and to cultivate a common research practice between researchers and novices to ensure authenticity and validity of data.

Right from the beginning, the group sessions turned out to be a crucial methodical element for studying practice. First, the researchers got the chance to complete their understanding of the diary entries by probing novices about vague or deficient descriptions. Second, several individual experiences of novices could be brought into perspective leading to collective learning and to a more comprehensive picture of practice. In the dialogue with each other new aspects, unaccounted for in the diaries, unexpected relationships between artefacts, people, and activities emerged. We are convinced
that documenting the learning process in form of diaries can be just one part of the whole research process. Interaction between researchers and novices constitutes an important additional element of the novice-based approach. Both novice diaries and group discussions complement each other. The diaries provide a first snapshot of the practice for the researcher. They allow for a well-informed discussion among novices as well as with the researcher. The discussions become the entry point into practice and situate diary entries into the larger context. We agree with Gherardi (2012) that reciprocal knowledge between researchers and practitioners and a participative research relationship enabling mutual learning are crucial principles for studying practices ‘from inside’. Therefore, we recommend conceiving novices not as ‘objective’ instruments, but rather as active participants in the research process.

Ultimately, our objective was to investigate whether such a method is useful to study the relational nature of information infrastructure. For instance we were hoping to find traces of how pharmacies are interrelated with other practices. Reflexivity stimulates learners to learn meaningfully (Moon, 1999). While we believe that it allowed us to capture the situatedness of practice, we have to admit that the primary focus of the diaries was concerned with everyday tasks of an apprentice within the context of the pharmacy. It seems that reflection on the constellation of practices requires a reflexive attitude that is seldom achieved in the diaries themselves. The final workshop proved very insightful in this regard. Our novices freely shared how their activities are linked and dependent on input by other professionals (e.g. physicians). The discussion of the workshop highlighted that important aspects may be at the back of a novice’s mind and only indirectly or incompletely present in the diaries. The zooming-in of the novice diaries was complemented with the zooming-out of critical reflection in the workshop.

7 Conclusion

In this paper, we have discussed the suitability and challenges of the practice probes method for studying II from a practice lens. Practice probes were suggested by Reimers et al. (2011, 2013) as a method to overcome the opacity problem of practices. In a first run, we tested the research technique of novice diaries with pharmaceutical students. The results show that novices reveal valuable insights into the situatedness of practice. However, methodical training, conceptual preparation, and interactive workshops influence the type and the quality of data to a large extent. Practice has to be turned into an epistemic object on which novices are able to reflect on. Involving novice practitioners in data collection, hence, requires the cultivation of a common research practice. We recommend conceiving them as research participants of an interactive, evolving research process instead of “objective” instruments for data collection.

Based on our results, we find reflexive novice diaries a useful technique to trap the meaning of practices. Yet, we believe that novice diaries need to be complemented by interactive elements in order to allow for mutual learning among novices and between researchers and novices. The workshops were crucial to ensure the quality of data as authenticity and validity emerged from collective knowing, from overcoming the past aspect of practice, and from zooming out on the constellation of practices. By methodically addressing both views on practice - the accomplishment of practices and their relationships in time and space - our method encompasses both the ‘large’ and the ‘small’ dimension of II.

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