Fostering Literacy with come_IN Computer Clubs

A Study of the Levelling Effects of Crafting, Making and Learning in the Intercultural Neighborhood

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Part I.

Introduction

1. Introduction

This study is based on two observations. The first observation is concerned with societal development, where migration continues to be a major driving force for social and cultural differentiation. The more increasing the number of migrants seeking first for access and then for participation in society, the more urgent the need to find ways to identify and agree upon the elements that hold this society together. The second observation this study is based upon is focused on technology. It is recognizing information and communication technologies (ICT) to be increasingly omnipresent in everyday life, and digitalization to be the motor of profound societal changes, bearing great opportunities for many, but leaving others behind.

At the local city level, both developments 'meet', as citizens are facing the need to situate themselves in an everyday life of increasing social and cultural diversity, and rapid technological change. Migration is entailing problems and challenges on the local level, e.g. when many people are newly arriving at the same time with no orientation, little or no knowledge of the language, maybe coming from very different cultural backgrounds, little or no money, no work (and frequently little or no chance to easily change this status for legal reasons), few or no friends and few or no supporting family structures within easy reach. Digitization is entailing problems and challenges, as everyday life issues like finding housing, finding and applying for work, or handling organizational matters with the city administration requires basic, if not advanced digital, computational skills.

1.1. Observation I: Migration as Major Driving Force for Social and Cultural Differentiation

Migration continues to be a major driving force for social and cultural differentiation. In Germany, this has developed in three distinct migration movements since 1945. For one, Germans and people of German ancestry have been migrating to Germany from the East (Herbert, 1990). In the 1960s and early 1970s, people migrated to Germany from Italy, Spain and Greece, Turkey, Morocco, Portugal, Tunisia and Yugoslavia as so called "guest workers" (Münz and Ulrich, 1998). The term embodies the countries longstanding hesitation to acknowledge its own status as a country of immigration (Thränhardt, 1995): Guest workers are temporary, not meant to stay for good. Only in 2004 did German legislation pass a new immigration law, thus acknowledging on the highest political level, that Germany is a country of immigration (Bundesgesetzblatt, 2004). Refugees constitute the third migration movement, reaching a height in 2015, with 890,000 persons seeking for

asylum (Bundesamt für Migration und Flüchtlinge, 2015, p. 9), and city administrations across the country struggling to organize and care for the arrival, accommodation and then societal integration of this large number of newcomers.

In public discourse these movements have been mirrored in sometimes heated debates and catchy images: journalism warned "das Boot ist voll" ("the boat is full") (Jung et al., 2000), and people worried about emerging "Parallelgesellschaften" – ("parallel societies") (Bukow et al., 2007) neighborhoods, where migrants lived with little or no contact to the mainstream society. Scientific discourse in sociology, politics, media and communications studies argued the acknowledgement of a multicultural society was nothing less than the facilitation of societal segregation into several sub-communities co-existing within one nation (D'Amato, 2001, p. 27), and that only assimilation to one dominant societal community could ensure societal stability (Hoffmann-Nowotny, 1992).

This argument can be traced back to sociological discourse of the "Chicago School" of the early 20th century, establishing a cultural perspective on migration discourse where the need to move, to assimilate was ascribed to the immigrating individual (Park, 1928). Others – prominently among them sociologist Radtke (2012) – welcomed the voice of immigrants in public discourse, arguing for a plurality of voices, as long as these are founded on a set of values and norms that are commonly agreed upon. Setting the arrival structures for the above described migration movements is organized at different, nested levels (Schuck and Münz, 1998). At the national level, the general rules and conditions for migration are decided upon. At the communal level, the integration of newcomers to everyday life is organized, and the conditions for the actual integration at the local level of neighborhoods are set (Sackmann, 2001, p. 15). Pott (2001) has made a claim for the reconsideration of space as a factor in urban planning: citizens of socially and culturally diverse neighborhoods should have a voice in the development process of their respective quarters (ibid., p. 72), in order to facilitate and sustain the permeability of social urban space.

The ongoing debate about how to achieve societal integration – the creation of a diverse yet unified societal whole – has unfolded along the lines of structural and cultural implications. While the former are concerned with equal access to all parts of societal life, such as justice, governmental institutions, education, labor, standard of living, social security, the latter focus on the creation of a common basis for living that is based on common language, core values, common rules and mutual respect for and knowledge of social and cultural differences (Klopp, 2002; Green, 2013).

Central is the process-like nature of both. Integration, as is discussed in scientific research, politics and common public discourse, is a process where the attitude towards one's own identity as well as developing relations to other groups are defining factors for progress (Berry, 1984, 1992). Numerous initiatives have developed over the years, each usually addressing one of the aspects involved and focusing e.g. on access to education and teaching (Woellert et al., 2009), diversity in media production (Müller, 2009) and consumption (Weber-Menges, 2005), and the workforce in general (Tatli et al., 2012). Under the headword of sustainable diversity, these various approaches were merged into

one discourse (Janssens et al., 2010), pointing to the need for a balanced interplay of economic, cultural, social, governance and decision-making structures (ibid., p. xvi).

1.2. Observation II: Information and Communication Technologies as Motor of Societal Change

The second observation this study is based upon is focused on technology. It is recognizing information and communication technologies (ICT) to be omnipresent in everyday life, and digitalization to be the motor of profound societal changes. These changes come along with great opportunities for many, but they are leaving others behind. Access to, and use of information and communication technologies (ICT) plays a central role in ensuring equal access to, and participation in all parts of everyday life. This, however, is for significant segments of society not given. A *digital divide* exists and has sparked debates in scientific as well as public discourse (e.g. Hilbert, 2011; Norris, 2001; Van Dijk and Hacker, 2003; Warschauer, 2004).

The initial, ideal perspective on the digital sphere saw decentralization, globalization, harmonization and empowerment (Negroponte, 1996, p. 229) at work, bottom-up power in effect and peers holding sway (Kelly, 1999, p. 18). Against this background, the digital divide was originally described to be a matter of having or not having access to ICT (Eszter Hargittai, 2003; Hilbert, 2011). With society's increasing penetration with ICT it has soon developed to a more refined question of access to ICT skills and bandwidth (Blau, 2002; Mossberger et al., 2003; Van Dijk and Hacker, 2003): the "binary question about the "haves" and the "haves not" (...) has become a structural question about the "haves much" and "haves little"." (Hilbert, 2011, p. 822). Here, Iske et al. (2004) have emphasized that a focus on the social component of differences and inequalities in digital participation is needed. Esping-Andersen (2005) has shown, how "a cumulation of social scientific evidence suggests that individuals' life chances remain as powerfully determined by their social origins as in the epoch of our fathers and grandfathers. (...) The evolving knowledge economy will "up the ante" in terms of the skills and qualifications necessary for a good life. Those who acquire insufficient human capital today will, with growing likelihood, find themselves locked into a life of low pay and precariousness" (ibid., p. 14). Various studies have confirmed this argument with regard to digital participation (e.g. Mossberger et al., 2003; Tondeur et al., 2011; Zinnbauer, 2007).

Seeking to bridge the digital divide, a closer look at its constituents is needed. Recurring on Van Dijk (1999), Van Dijk and Hacker have provided a basic categorization of barriers to access, distinguishing "1) Lack of elementary digital experience caused by lack of interest, computer anxiety, and unattractiveness of the new technology ("mental access"), 2) No possession of computers and network connections ("material access"), 3) Lack of digital skills caused by insufficient user-friendliness and inadequate education or social support ("skills access"), and 4) Lack of significant usage opportunities ("usage access")." (Van Dijk and Hacker, 2003, p. 213). In their study of young people, Iske et al. (2004) have

stated a "voice divide" (ibid., p. 14) alongside the digital divide, differentiating among those capable of accessing the digital sphere, and those actually actively participating.

Multiple initiatives have developed over the years, seeking to address one or multiple of these aspects of the digital divide. These have unfolded along the lines of *policy, technology,* and *community.*

At the policy level, initiatives like Stiftung Digitale Chancen[1] and Klicksafe[2] engage in digital inclusion, usability and accessibility, the promotion of media literacy, and online safety, thus contributing to the leveling of mental and material access as well as usage opportunities (Van Dijk and Hacker, 2003). The latter is also at the heart of the Open Knowledge Foundation's[3] engagement for an informed and skilled access to and participation in the digital sphere. This becomes visible e.g. in initiatives like the "edulabs", where digital driven methods are employed for open education, or "Datenschule" (data school), where the finding, analyzing and visualizing of data to the design of data-driven projects is taught as an empowering means for citizen initiatives. Data is everywhere in everyday life, so the reasoning behind the "Datenschule", but what is needed is the skill to make sense of it and participate. The non-profit organization "Code.org"[4] strives to influence working and learning conditions to expand access to computer science and the digital world in schools and to increase participation in computing by women and underrepresented minorities.

At the technology level, a shift in educational perspective has manifested itself in a number of physical as well as digital tools, hard- and software (Blikstein, 2013). Solomon identifies four categories of activities to be central to educational computing: computer literacy, programming, games, and computer-assisted instruction (Solomon, 1988, p. 3). Where a traditional approach to teaching computing and coding skills is focused on the solving of mathematical tasks, and finding the one answer to a given analytical problem, the recognizing of the pervasiveness of information and communication technology (ICT) as well as of the digital divide has encouraged the design and development of hard- and software allowing for bricolage and tinkering (Martinez and Stager, 2013) and taking the process it takes to reach a certain answer as serious as the actual result. Where computing had had the image of being a highly specialized skill set, these programming languages, hard- and software were designed to be inclusive and broadly appealing, thus contributing to bridging the digital divide. Seymour Papert's ideas of learning with computers and learning computing (Papert, 1993) have laid the grounds for an approach where "education about computers was never about the devices themselves but ultimately about our own passions and our own desires to connect with each other" (Kafai and Burke, 2014, p. xv). Constructionist principle sees successful learning rooted in "interesting microworlds" (Papert, 1993, p. 140), where the knowledge that is to be acquired can actually be *used, thought about and played with.*

[1] `https://digitale-chancen.de`
[2] `https://www.klicksafe.de`
[3] `https://okfn.de`
[4] `https://code.org`

The Logo programming language (Brian Harvey, 1985) is among the earliest to follow this principle. Designed primarily as a tool for learning, the interpreted language provides learners with immediate feedback when there are errors; it is modular and extensible, thus allowing for complex projects to be developed in small steps. More recently, the Scratch programming environment was developed to foster the self-directed learning of programming concepts "through tinkering and collaboration with peers" (Maloney et al., 2010). Enabling the creation of interactive stories and games using photographs as well as self-made drawings, it speaks to the individual user's creativity and self-expression. Coming with an online community platform[5], where users can share their creations and also download and look into the projects of others to see the code, remix and develop further, it fosters (distributed) learning from and with peers (Resnick et al., 2009) and the active creation of digital content rather than its mere passive consumption: "*Digital fluency* should mean designing, creating, and remixing, not just browsing, chatting, and interacting." (Resnick et al., 2009, p. 60). Teachers are recognized as key figures in this process and addressed with a "Scratch-Ed" online community (Karen Brennan, 2009).

This development of programming languages and environments especially designed for and directed towards children and novices in computing was extended towards the non-digital, physical world in the form of electronics kits and programmable tangibles. Several sets of tangibles linked to crafting and making skills using everyday materials, like the electronics kit LittleBits where discrete electronic components are pre-assembled in tiny circuit boards, so that the creation of interactive artefacts is enabled for a non-specialist group of users (Bdeir, 2009). Buechley and colleagues have explored the combination of sewing and textiles with programming. They found the design of soft wearables using the LilyPad Arduino in a workshop series with children to be suitable for the teaching of programming skills and computational knowledge, closely linking it to crafting and the exploration of art and design (Buechley et al., 2008; Buechley and Hill, 2010), which was found to be inclusive across genders. LittleBits as well as the Calliope mini (G. Brandhofer, 2017; Przybylla and Romeike, 2018) were carefully designed to tie in to school learning and lesson plans as early as elementary school age. Just like with Scratch, here too, online communities[6] providing project ideas and instructions namely to educators, foster the close link to formal and curricular learning contexts.

Recognizing the material, access-related aspect of the digital divide, a line of discourse and development evolved, specifically aiming at the inclusion of new classes of users (Blikstein, 2013, p. 24), e.g. very young children or children in the developing world. Famously among these is the OLPC: at a time where the retail price for a laptop typically exceeded 1.000 USD, the initiative brought forward the low-cost and low-power laptop OLPC XO to enable access to digital and online content, media and programming tools especially for children in low-income countries (Kraemer et al., 2009; Warschauer and Ames, 2010; Ames and Rosner, 2014).

Parallel to these technological developments, the social and community level came to

[5] `https://scratch.mit.edu`

[6] `https://www.littlebits.com/education` and `https://calliope.cc/community`

the fore. The installation of digital platforms providing sharing, remixing and discussion opportunity as well as supplementary educational material to the programming tools and tangible devices can be seen as recognition of the importance of the surrounding social conditions.

Initiatives like "Jugend hackt!"[7], "Code Week"[8] and the "TinCon Festival"[9] provide regular opportunity for exchange and joint activity to youth and computing novices. The goal: the acquiring and creative use of computing and coding knowledge should become as normal as learning and using maths or writing and reading skills. In the US, a network of computer clubhouses has developed, based on principles of situated learning (Lave and Wenger, 1991) and constructionist thinking (Chapman, 2006; Papert, 1980). Starting out in 1993 with the first computer clubhouse in Boston, these spaces have over time evolved as meeting places especially for disadvantaged inner-city youth where access to computer and modern media equipment is provided on a regular, every-day basis, and thus creative self-expression and the acquiring of ICT knowledge are fostered. The development and success of this constructionist approach is well documented in research (Resnick and Rusk, 1996a; Kafai et al., 2009).

1.3. One Approach to Two Divides: Building Bridges with Intercultural Computer Clubs

It is the contribution of this study to think the above detailed two observations together. Focusing on the micro-level of the socially and culturally diverse neighborhood, the impact of intercultural come_IN computer clubs is evaluated. Situated at the local neighborhood level, this socio-technical initiative offers a place for shared (computer-) practice of children and adults, thus bringing together people with different migration backgrounds. Once a week they voluntarily gather in the computer club to work on joint projects or to realize their individual ideas at the computer, to study and to play. The long-term study of these clubs reveals chances and limitations of this method with regard to societal integration as well as the bridging of the digital divide.

Embedding technology access and skill acquirement in a decidedly open local social structure, the intercultural come_IN computer clubs have been developed as a response to both, an increasing social and cultural diversity, and a prevailing, if not increasing digital divide. The opportunity for collaborative play, learning and work with computers and modern media is apt to build bridges among people of different ages, cultural and social backgrounds is the basic idea that lays the grounds for the concept of the intercultural come_IN computer clubs. Over the course of the past decade, these clubs have built their works around the values of cross-cultural understanding and respect, thus translating the outcomes of the larger societal debate on migration and diversity to the local

[7] `https://jugendhackt.org`
[8] `https://www.codeweek.de`
[9] `https://tincon.org`

level of the socially and culturally diverse neighborhood. By offering open yet guided access to computer technology and modern media and related skills for the neighborhood's mainstream and immigrant groups, the computer clubs work to foster community dynamics and the strengthening of social ties – on the family, school and neighborhood level.

This entails a number of structural implications. For one, access to the computer club is voluntary and free of charge: whoever wants to participate is welcome to join. This open structure extends to contents as well: the clubs do not pursue a lesson plan. Instead their young and adult members bring ideas and questions to the club where they are then jointly discussed and – if agreed upon – turned into some kind of collaborative project activity. Most clubs are located in schools, as well as community centers. These locations have been carefully chosen, as they represent common ground to a broad and diverse range of people in the neighborhood. Finally, it is an important element of the computer club's works that children and adults from the neighborhood are invited to participate in the club's activities together. That way an intergenerational learning experience is established within the club and its activities that can then find a continuation in family or neighborhood contexts. Tutors and teachers provide guidance and help when needed in the computer club project work, and an atmosphere is established, where joint learning and the sharing of expertise among club members is encouraged. With this structure, the intercultural computer clubs have built on the US computer clubhouses' principles (Kafai et al., 2009) of situated learning (Lave and Wenger, 1991) and constructionist thinking (Papert, 1980), applying their approach to the intergeneral and intercultural local neighborhood setting. The come_IN computer club initiative has existed for almost fifteen years now, and it has grown into a network with six clubs in various cities in Germany. Furthermore, two clubs in Palestine have become part of the network more recently (e.g. Aal et al., 2014).

This work is structured as follows. By situating come_IN in discourses on cultural as well as computational and media literacy, we first carve out how all activity in come_IN balances learning at four interrelated ends: the Self and the Other, the Non-Computational and the Computational.

The next part of this work then focuses on matters of cross-cultural understanding and respect. Chapter 5 "Extending Value-Sensitive-Design to Off-the-Shelf Technology" presents three cases from the computer club in focus here, highlighting the challenges inherent in matching existing ICT with values that are explicitly identified in the initiative and that evolve over time (Weibert et al., 2017c). Open communication structures among researchers and local practitioners are presented as central, as well as methodological support that is needed to span a wide range of user experiences. Similarly, Chapter 6 "All of a Sudden We Had this Dialogue..." points to collaboration in the computer-based project work as key elements for the support of cross-cultural understanding and respect as part of the sustainable integration of a socially and culturally diverse society (Weibert and Wulf, 2010). Chapter 7 "Lifecycles of Computer Clubs" shows how patterns evolve in the collaborative activities of the young and adult learners in the club – starting at

the level of the completion of individual tasks within the project-work, to larger patterns spanning the time of a club project or even the entire school year (Weibert et al., 2016). Chapter 8 "Interactive Storytelling" discusses the importance of storytelling elements in the learning (Schubert and Weibert, 2014), and Chapter 9 "Sewing Interest in E-Textiles: Analyzing Making from a Gendered Perspective" explores e-textiles as a means to challenge traditional perceptions of electronics, programming and crafts (Weibert et al., 2014).

Subsequent chapters look beyond the club itself, focusing on its situatedness in the school, the neighbourhood and beyond. Chapter 10 "Locating Computer Clubs in Multicultural Neighborhoods" does so by discussing different computer club activities, as well as their (mobile) technological support (Schubert et al., 2011). Chapter 11 "Hey Can We Make That Please?" then focuses on the question how this has an effect on identity and community building (Weibert et al., 2015). In the following, Chapter 12 "Creating Environmental Awareness with Upcycling Making Activities" this computational and non-computational learning is situated in a broader context of environmental awareness (Weibert et al., 2017b).

These findings are then discussed in light of the previously carved out framework of literacy in come_IN, balancing the Self and the Other, the Non-Computational and the Computational. We conclude by summarizing, how young and adult learners of very diverse backgrounds are motivated to learn and develop a procedural, layered literacy in come_IN, and how this method can thus provide a combined response to social and cultural differentation of society as well as the so called digital divide (Norris, 2001; Wagner et al., 2002) that results from the increasing permeation of everyday life with ICTs.

2. Related Works

The social and cultural differentiation of society, as well as the omnipresence of information and communication technology in everyday life, calls for the development of *literacy* at several, nested levels. At its core, each of these levels is concerned with learning, with an individual's advancement in knowledge, and with his or her abilities to apply this knowledge in context: *procedural literacy*. In the following, concepts of *learning* and *literacy* will be specified, and a detailed description of their application to the subject of study – intercultural computer clubs – is provided.

2.1. Learning

Scientific discourse on learning unfolds on several levels. These are interrelated, taking an individual's achievement of advancement in knowledge as a starting point of inquiry. Popper (1972) describes learning as a natural selection process, always rooting in practical or theoretical problems (e.g. Savery, 2006), and developing by means of argument, discussion and selection of hypothesis and the "elimination of mistaken beliefs" (Law et al., 2010).

Papert's constructionism (Papert, 1980, 1993) adds a material focus on the way that the learning occurs to this discourse. In this view, making things is a central part of the individual learning process. The basic idea is that knowledge is not only conveyed abstractly, but requires practical and cognitive (re-)construction on the side of the learner. Materials, tools, context, are seen as individual representations, artefacts, or objects-to-think with, and are important details in support of the learning process.

From a constructivist perspective, knowledge and understanding develops through the process of an individual's constant interaction with the environment: the communication of ideas in a group fosters processes of self-explanation and justification. Both these processes are significant elements for learning and knowledge building, so studies have shown (e.g. Rogoff, 1990, 1999; Savery and Duffy, 1995; Webb, 1991).

The engagement with more skilled partners further supports learning: In the interaction with others, Vygotsky (1978) identified a zone of proximal development where mental development (of children) can be positively influenced by an adult or more skilled peer. Along these lines, Jean Lave and Etienne Wenger have argued that learning is closely interwoven with a social context (Lave and Wenger, 1991). Analyzing learning in a number of formal workplace-settings – among them the workplaces of midwives, tailors

and meatcutters – Lave and Wenger have shown how apprenticeship learning occurs: newcomers, such is their general argument, join the respective workplace community and learn by participating in its activities and tasks – first on the fringes, and gradually advancing more complex and central tasks within the community. In this view, learning is "an evolving, continuously renewed set of relations" (Lave and Wenger, 1991, p. 53) with others who are concerned with the same topic of interest within the same structured social (workplace) context.

This notion of learning in "communities of practice" has quickly become a contested one. The concept works well to explain processes of learning in structured social settings like the workplace. Here, the formalized overall setting determines the formation of the group, and individual motivations to participate. As soon as settings are more open and less formalized, the concept does not suffice to explain how the community forms itself. Gee, among others (e.g. Contu and Willmott, 2003; Handley et al., 2006; Lindkvist, 2005; Roberts, 2006), has criticized "communities of practice" to carry with them misleading connotations of " "belongingness" and close-knit personal ties among people" (Gee, 2005b, p. 214). Communities are seen as cozy places of belonging and common understanding Bauman (2000), thus attempting to "label a group of people" (Gee, 2005b, p. 215) distinguishing among insiders and outsiders. Handley et al point to the ambiguity that is inherent to the notion of participation in the concept: "the difficulty of knowing when an individual is or is not 'participating' in a community of practice" is seen to be at the heart of this ambiguity (Handley et al., 2006, p. 649), and this is problematic in that "participation entails a sense of belonging (or a desire to belong), mutual understanding and a 'progression' along a trajectory towards full participation which — indirectly — defines the community which is the target of 'belonging"' (ibid.). Furthermore, Gee points to aspects of time being critical in the concept, challenging its applicability even with regard to the original workplace context it was developed in: "Communities of practice suggest a degree of trust and mutual understanding both of which require time to develop. We might then regard the traditional community of practice to be a *slow community*" (Gee, 2005b, p. 633), Gee states, thus questioning the appropriateness of "the community of practice as a means of managing knowledge in an era driven by acceleration" (ibid.).

Further along the lines of this "social turn" Gee (2005b) scientific discourse on the social aspects of learning branches in studies on collaborative learning exploring the effectiveness of tutored learning and learning among peers (e.g. Nelson-Le Gall, 1992), learning in traditional classroom settings as well as out of school situations (e.g. Salomon and Perkins, 1998) and technology-based learning environments (e.g. Singley et al., 1999). Salomon and Perkins make an argument to approach individual and social aspects of learning "as two levels of analysis, each of which sometimes neglects the other" (Salomon and Perkins, 1998, p. 2). Focusing on both levels in a comprehensive approach allows for an understanding of the individual part of learning as well as its social and participartory component: "There is ample evidence to show that individuals' learning is facilitated by others, that meaning is often socially constructed, that tools serve as mediators, and that social systems as organic entities can engage in learning much as individuals do." Aspects

of distributed cognition are included in this understanding that learning becomes more substantial and effective when the involved parties can learn from each other by engaging in the collaborative creation of artefacts (e.g. Salomon and Perkins, 1998; Hollan et al., 2000). Similarly, Stahl argues for an incorporating approach when he develops a framework spanning "models of knowledge building, perspectives and artifacts – and grounded in empirical analysis of collaborative interaction" (Stahl, 2002, p. 62).

For our study of intercultural computer clubs, this comprehensive approach to learning as a phenomenon with an individual as well as a social level is important. It allows for an understanding of the steps that an individual takes to advance his or her knowledge towards the kind of literacy that is needed to get along in an increasingly digitally and culturally diverse everyday local life.

2.2. Literacy

But what does this mean? In its literal sense (sic), the word roots in the latin term "litera", which translates to "letter". From there, it quickly gets complex. Understandings of literacy are manifold and its meaning is not easily conceptualized into some kind of definition (U.S. Congress, Office of Technology Assessment, 1993, p. 3). On very general terms, literacy encompasses "a broad spectrum of related abilities, further sub-defined according to some particular functional requirement" (McMillan, 1996, p. 162). This spectrum of abilities is not static – as noted in a U.S. Congress report on the subject matter, "almost 100 years ago the proxy for literacy in the United States was being able to write one's name" (U.S. Congress, Office of Technology Assessment, 1993, p. 3). This almost exclusive focus on reading and writing skills was prevalent throughout the late 1980s (Reinking et al., 1998, p. xiv).

The perspective that literacy may be concerned with much more besides reading and writing skills has entered scientific discourse alongside the agreement that information can take the shape of many things, including oral and audio, visual and gestures. Coining the term "multiliteracies", Cope and Kalantzis point to the fact that there may be modes of representation involved, which are "much broader than language alone" (Cope and Kalantzis, 2000, p. 5), including the audio, the visual, spatial, behavioural, and digital, to name but a few, in their view on processes of "meaning-making".

Turner has emphasized the distinction between literacy (meaning the ability to read and write) and functional literacy (meaning the ability to read and write in a specific context) to be the one general claim that can be made about literacy after all: "After that it all gets very hazy." (Turner and Saint Paul, 1993, p. 1). McMillan (1996) has identified careless use of the term and concept in a variety of ways to be a reason for this haze; as a result, so his argument, the word became overloaded with meanings over time (McMillan, 1996).

There are, however, a number of general characteristics of literacy that can be distilled

from this diverse scientific discourse on the subject matter. The National Adult Literacy Agency's definition points to the concept's multiple dimensions and areas of application: "Literacy involves listening and speaking, reading, writing, numeracy and using everyday technology to communicate and handle information. But it includes more than the technical skills of communications: it also has personal, social and economic dimensions. Literacy increases the opportunity for individuals and communities to reflect on their situation, explore new possibilities and initiate change." (National Adult Literacy Agency, 2011, p. 1). The concept is multi-faceted and evolving, constantly adapting to the rapidly changing cultural and socio-political conditions and expectations (McMillan, 1996, p. 162).

Literacy – that's a stable point of reference – is a social practice (e.g. Barton, 1994; Street, 2003; Gee, 2005a). Exploring what this means, scientific discourse has approached the subject from two main angles, focusing 1) on the topical areas where literacy becomes a relevant social practice, and 2) on the actors involved in fostering and supporting the learning steps that an individual takes to advance his or her knowledge towards a literacy.

The topical areas, where literacy is a relevant concept encompass everyday life (e.g. Hamilton and Barton, 2005), family life (e.g. Shockley et al., 1995; DeBruin-Parecki and Krol-Sinclair, 2003), citizenship (e.g. The New London Group, 2000; Banks, 2007; Arthur et al., 2014), work life (e.g. Mikulecky and Kirkley, 1998; The New London Group, 2000), the educational (e.g. Gregory and Williams, 2002), the cultural (e.g. Arvizu and Saravia-Shore, 2017; Giroux, 1992, 2007; Steyn, 2015) and the digital sphere (e.g. Reinking et al., 1998).

An argumentative consequence of the positioning of literacy as a social practice is the recognition of the institutional and power dynamics involved. Emphasis is placed on an understanding of differences, of the things that distinguish, even separate, e.g. when Giroux' employs the image of borders to come to an understanding of the role of education in this context: "The concept of borders provides a continuing and crucial referent for understanding the co-mingling – sometimes clash – of multiple cultures, languages, literacies, histories, sexualities, and identities. Thinking in terms of borders allows one to critically engage the struggle over those territories, spaces, and contact zones where power operates to either expand or to shrink the distance and connectedness among individuals, groups, and places." (Giroux, 2007, p. 2). There is an element of freedom and emancipation in literacy as social practice, as was noted by Freire (1970), when he described literacy to be a means and a process enabling individuals and peoples to move from simply existing in this world to a state where they are capable of "knowing" (ibid., p. 212), considering ideas and reflecting "upon their world".

In the context of the study of intercultural computer clubs as a means to get along in an increasingly digital as well as socially and culturally diverse everyday life, this notion of literacy as social practice is important as it describes the steps needed to be equally concerned with the individual as well as with its relation to others, in a range of digital and non-digital modes of expression. Accordingly, the subsequent sections of this chapter focus on cultural literacy, computational and media literacy, and their interplay

as procedural literacy.

2.2.1. Cultural Literacy

As this world is an ever increasingly culturally and socially diverse place, this ability to reflect and to become culturally expressive has become a key skill. Identity, in this world, is not perceived as a fix, permanent entity, but it is rather seen as a structure that is lifelong in motion, constructed from separate yet related elements, which are sometimes next to each other, and overlapping at times (Enders and Weibert, 2009, p. 333). With regard to culture, this perspective implies, that an individual can navigate several cultures at once – a view that has been prominent in contemporary anthropology and postcolonial studies, e.g. when Irani and colleagues describe culture to be "a lens through which people collectively encounter the world – a system of interpretive signification through which the world inter-subjectively meaningful. From this view, an individual may participate in many cultures – cultures of ethnicity, nationhood, profession, class, gender, kinship, and history – each of which, with its logics and narratives, frames the experience of everyday life" (Irani et al., 2010, p. 1313).

This, however, is a bi-directional dynamic. The view that a subject can not only write but is written by culture is a central element in this discourse – as well as the question how a subject can change culture. Literacy, in that regard, acknowledges that "meaning is not fixed and that to be literate is to undertake a dialogue with the multiple languages, discourses and texts of others who speak from different histories, locations and experiences" (Giroux, 1992, p. 2).

This is especially important with regard to migration experience, where cultural literacy is a central element in a newcomer's adaptation experience (Berry, 1984, 1992) to the receiving society: integration, accommodation, separation, and marginalization all mark different specifications of cultural expression, each being part of the newcomer's arrival experience in the new country.

Again, there is a bi-directional dynamic. Scientific discourse has made an argument for the centrality of culture in education. In the context of migration, this approach embraces newcomers and members of the receiving society alike, encompassing mutual knowledge and understanding of other cultures' patterns of interaction, values, institutions, metaphors and symbols as well as cross-cultural communication skills (Arvizu and Saravia-Shore, 2017). Giroux calls for the creation of "alternative public spheres" to enable "the formation and enactment of social identities, but also for enabling the conditions in which social equality and cultural diversity coexist with participatory democracy" (Giroux, 2007, p. 14).

This perspective distances itself from taxonomic notions of culture as acquired and internal to an individual – a perspective most prominently voiced in Hofstede's framework of culture as "software" for the minds of a nation's people (Hofstede, 2011). Culture, such is a central recognition in scientific discourse, is "dynamic, collectively produced,

and enacted in everyday encounters" (Irani et al., 2010, p. 1313).

With regard to the study of intercultural computer clubs, this social and interactional view is important, as it acknowledges the dynamic, procedural nature of cultural literacy – describing a skill-set that enables the individual to position herself in the socially and culturally diverse context.

2.2.2. Computational and Media Literary

The ability to become computationally expressive has become a key skill in an ever increasingly digital world. In HCI and related disciplines, as well as in educational discourse, this development has resulted in strong claims for programming as a key skill, even a literacy (Prensky, 2008; Vee, 2013) everyone should achieve. As the permeation of (urban) everyday life is swiftly progressing, being able to program means the ability to participate – and thus is a matter of power. "Power will soon belong to those who can master a variety of expressive human-machine interactions" (Prensky, 2008, p. 1), thus learning programming and "to bend digital technology to one's needs, purposes, and will" (Prensky, 2008, p. 1) gives people "access to the control panel of civilization" (Rushkoff, 2010).

This narrow focus has soon given way to broader visions. The concept of computational thinking received much attention in scientific discourse with Wing's article "Computational thinking" (Wing, 2006). She makes a claim for computational thinking as a "universally applicable attitude and skillset for everyone" (ibid., p. 33). Wing, along with other researchers following up on this viewpoint (e.g. Barr and Stephenson, 2011; Grover and Pea, 2013; Guzdial, 2008; Lye and Koh, 2014), calls for the early teaching of a broad, analytical mind-set, capable of re-shaping problems into formats that are solvable "perhaps by reduction, embedding, transformation, or simulation" (Wing, 2006, p. 13). The following six characteristics shape the concept of computational thinking:

- "Conceptualizing, not programming" is at the core.
- It is a "fundamental" not a "rote" skill that everyone should master in order to fully participate in modern society.
- It is a way that "humans, not computers think" – it is the human being who made the computer, not vice versa, and it is the human being who has more imaginative abilities in solving problems.
- It constitutes a complement to and combination of mathematical and engineering thinking.
- "Ideas, not artefacts" are at the core of problem solving.
- Being central for much of human activity – in and outside of computer science – it should be "for everyone, everywhere".

In countries across the globe, primary and secondary school's curricula have included this comprehensive, and early approach to computing and computational thinking (Berry, 2013; Kultusministerkonferenz, 2011; Informationsteknologi, 2014). Barr and Stephenson (2011) have put forward a concept of how to include computational thinking in K-12 lesson plans in the U.S.

The broad claim that computational thinking be a skill- and mind-set for everyone prompts the question, how a diverse spectrum of learners can be engaged in this process. Here, educational discourse on computational and media literacy has moved from a rather analytical and mathematical perspective, relying on predefined step-by-step paths to one solution, towards an experiential and learner-focused approach. It connects to a long educational discourse (Samuelsson and Carlsson, 2008) that can be traced back to John Dewey at the turn of the century (Dewey, 2013). This broader educational approach is thriving "in bricolage and recognizing the importance of the process not just the end result" (Rode et al., 2015, p. 239).

Including a "makeology" (Peppler et al., 2016b,a) point of view on learners as makers into the educational discourse on teaching computing and computational thinking allowed for the inclusion of diverse kinds of learners (e.g. Benda et al., 2012; Buechley et al., 2008), and learners with less linear, more hands-on, and creative learning styles (e.g. Grove et al., 2011; Rode et al., 2015). This participatory perspective of "connected learning" takes personal as well as social, cultural, and tangible dimensions into account (Kafai and Burke, 2014, p. 20). Computational participation "moves us beyond tools and code to community and context. It equips designers, educators, and researchers to broaden and deepen computational thinking on a larger scale than previously. (...) Computing for communicating and interacting with others builds relationships. Education activist Paulo Freire once said that 'reading the word is reading the world.' He was right. Today, reading code is about reading the world. It is needed to understand, change, and remake the digital world in which we live." (Kafai, 2016, p. 27). Mossberger and colleagues have discussed this ability to fully "participate in society online" as "digital citizenship" - comprising the skill and ability to effectively and regularly communicate, to recognize and fulfill democratic duties, and to also engage and "compete in the economic realm" (Mossberger et al., 2008, p. 2).

The scientific call for broad computational participation has led to a claim for (new) media literacy, including "any type of communicative interaction involving speaking, reading, listening, and writing with text in print and non-print forms" (Peppler and Kafai, 2008, p. 188), and being carried out in the form of "a set of social practices" (Barton et al., 2000). Text, in this view, is "no longer a sequence of alphabetic characters on a piece of paper; rather social arrangements, tagging, type of dress, singing, drawing, and dancing can all be viewed as texts" (Peppler and Kafai, 2008, p. 188).

This view broadens the options for participation in processes of computational thinking and learning in a Piagetian tradition (Piaget, 1977, 2013), and physical action and the activation of real world knowledge (McNeil and Jarvin, 2007) by means of tangibles have been identified as supportive elements (e.g. Marshall et al., 2003; Marshall, 2007;

Marshall et al., 2010; Price et al., 2003; Xie et al., 2008). Taking this line of discourse even further, more researchers have focused on embodiment as an essential part of learning and specifically STEAM learning (e.g. Antle, 2013; Atherton and Blikstein, 2017; Durán-López et al., 2017; Gourlet et al., 2017; Keifert et al., 2017; Unnikrishnan et al., 2016).

As technologies for communication, design, and entertainment become more ubiquitous discourse on how to prepare learners to not only expand their computational knowledge but to be capable to apply this knowledge in context, has evolved along the lines of a media literacy. Under this headword, an argument has been made that the ever increasing digitalization of public life brings along multiple opportunities to become involved in not only in the consumption but in the active creation of digital and media content. The notion of literacy in this context has expanded to encompass decoding, evaluating, and producing electronic media (Peppler and Kafai, 2008) and thus navigate an increasingly complex landscape of digital content, tools, communities, and artefacts. Jenkins (2006) has identified the evolving participatory cultures to be concerned with

- Affiliations – memberships, formal and informal, in online communities centered around various forms of media, such as Friendster, Facebook, message boards, metagaming, game clans, or MySpace)
- Expressions – producing new creative forms, such as digital sampling, skinning and modding, fan videomaking, fan fiction writing, zines, mash-ups).
- Collaborative Problem-solving – working together in teams, formal and informal, to complete tasks and develop new knowledge (such as through Wikipedia, alternative reality gaming, spoiling)
- Circulations – Shaping the flow of media (such as podcasting, blogging)

These digital and technological developments bear many opportunities for alternate forms of learning, diversification of cultural expression, new organizational forms of work-life and a shift in powers in citizenship participation. At the same time, all of this does not come by naturally. Discourse in educational disciplines and the learning sciences has recognized the need for policy and educational change, in order to prevent a "participation gap" by providing access to experience, skills and knowledge needed for "full participation in the world of tomorrow" for all (Jenkins, 2006, p. 3). This includes the ability to reflect upon the way that technology and media development affects everyday life, and emerging ethical standards that go along with the rapidly widening possibilities.

Jenkins explicates the characteristics of media literacy in a detailed framework (Jenkins, 2006; Jenkins et al., 2009):

- *Play* – the capacity to experiment with one's surroundings as a form of problem-solving
- *Simulation* – the ability to interpret and construct dynamic models of real world processes

- *Performance* – the ability to adopt alternative identities for the purpose of improvisation and discovery
- *Appropriation* – the ability to meaningfully sample and remix media content
- *Multi-tasking* – the ability to scan one's environment and shift focus onto salient details on an ad hoc basis
- *Distributed Cognition* – the ability to interact meaningfully with tools that expand our mental capacities
- *Collective Intelligence* – the ability to pool knowledge and compare notes with others towards a common goal
- *Judgment* – the ability to evaluate the reliability and credibility of different information sources
- *Transmedia Navigation* – the ability to deal with the flow of stories and information across multiple modalities
- *Networking* – the ability to search for, synthesize, and disseminate information
- *Negotiation* – the ability to travel across diverse communities, discerning and respecting multiple perspectives, and grasping and following alternative sets of norms (Jenkins, 2006, p. 4)

What can be taken from this nuanced and multi-faceted view on literacy is the need to develop a skill-set that enables to make connections across disciplines and topics. Computational and Media Literacy is concerned with more than the mere handling of information and communication technologies. It is concerned with the question, how to relate to and engage with these technologies in a meaningful, creative and thoughtful way in normal everyday life. It is concerned with the question how to understand and deploy them as useful tools to create meaning in multiple ways.

2.2.3. Procedural and Layered Literacy

As *procedural* and *layered* literacy, this nuanced perspective has found entrance in scientific discourse. Technological development and change, and the ubiquitous presence of computers and digital tools in multiple contexts of everyday life have called for an understanding how to enable children and adults alike to keep pace with these rapid developments. Making a claim for crossdisciplinary connections, Bogost argues that the "value of procedural literacy goes far beyond the realm of programming alone; indeed any activity that encourages active experimentation with basic building blocks in new combinations contributes to procedural literacy. (...) Engendering true procedural literacy means creating multiple opportunities for learners – children and adults – to understand and experiment with reconfigurations of basic building blocks of all kinds." (Bogost, 2005, p. 36).

This call for movement of thought and encouragement to experiment and explore applies to more than just computational education alone. Successful action in everyday life, such has become a basic agreement in educational and other settings, depends on learners being able to negotiate and manage a variety of literacy practices (Bhatt, 2012; Mackey, 2003) – and to continuously refine and develop this skill-set. With a focus on the 20th century workplace, and unpacking an abundance of scientific studies (e.g. Meyer and Bernhardt, 1997) describing the skill-set needed for a "workplace literacy", Cargile Cook's "Layered Literacies" (2002) identifies six central literacies needed to succeed in modern workplace environments: basic, rethorical, social, technological, ethical and critical literacy. Their interplay enables workers to "critique the workplace and work within it for positive change" (Cook, 2002, p. 8), by being able

1. "to communicate well and clearly" (ibid., p. 9),
2. rethorically "conceptualize and shape" an argument (ibid., p. 10),
3. "collaborate and work well with others" (ibid., p. 11),
4. deploy technology in meaningful ways to "to produce communications, documents, or products", and to "promote social interaction" (ibid., p. 13),
5. be aware of and "apply ethical concepts" (ibid., p. 15), and
6. be able to critically "recognize and consider ideological stances and power structures and the willingness to take action to assist those in need" (ibid., p. 16).

Similarly, Custer (2014) shows with a focus on gaming and game design, how these factors are relevant in the context of computational education and learning. Their interplay enables learners to first *develop* an understanding of rule-based systems by engaging in it, then *demonstrate* their awareness of the processes involved by engaging in the creation of a system of this kind, and finally *document* their understanding and skill by "creating procedural documentation for their design" (Custer, 2014, p. 248). Abrams has further differentiated this view by exploring how learners get involved in the process and what factors may determine their choice to continue or terminate learning. She details how this involves as the most basic layer an awareness for individual presets – "idiosyncratic circumstances and ruling passions" – determining an individuals involvement and learning engagement. Building on this is social inclusion as a second layered literacy – the recognition that technologies are costly and not necessarily easily accessible to everyone. Thirdly, "technologies exist within particular spaces and places as resources tied to contexts, cultures, and identities" (Abrams, 2014, p. xviii), and educators should recognize this and create space for learners to "relax and breathe with technology" (ibid., p. xix). Along similar lines, Prinsloo (2005) argued earlier that "socially located individuals draw on particular sets of perceptual, cognitive and cultural procedures and resources to make and take meanings from texts. ... [S]uch literacies cannot be understood as passive and decontextualised receptivities" (ibid., p. 3). In this context, Collin, Karsenti and Calonne have developed a descriptive framework showing how migrants develop a skill-set to navigate and successfully complete the migration process, positioning "the connected migrant"

between host and source society, and categorizing technology as a "migration object" as well as a "migration means" (Collin and Karsenti, 2012; Collin et al., 2015).

Finally, it is important to recognize multimodality: movement, visuals, gesture, touch, color are powerful modes of expression, and may be deployed in creative ways to guide thinking and actions and learning (Abrams, 2014, p. xix).

What can be distilled from these previous works is the insight that the skill-set in focus is extremely fluid, with few, if any, of the literacies involved being articulated in isolation. Rather, they are balanced in careful ways, considerate to enable the realization of a certain aim. This makes the layered, procedural understanding of literacy provides helpful in the context of this study of the impact of intercultural come_IN computer clubs: it enables the comprehensive approach of the cultural as well as computational issues addressed within the initiative.

2.3. Literacy in come_IN: Balancing the Self and the Other, the Non-Computational and the Computational

It is not the aim of this work to add yet another terminology to the above outlined discourse on literacy. Rather, this work focuses on the impact of intercultural come_IN

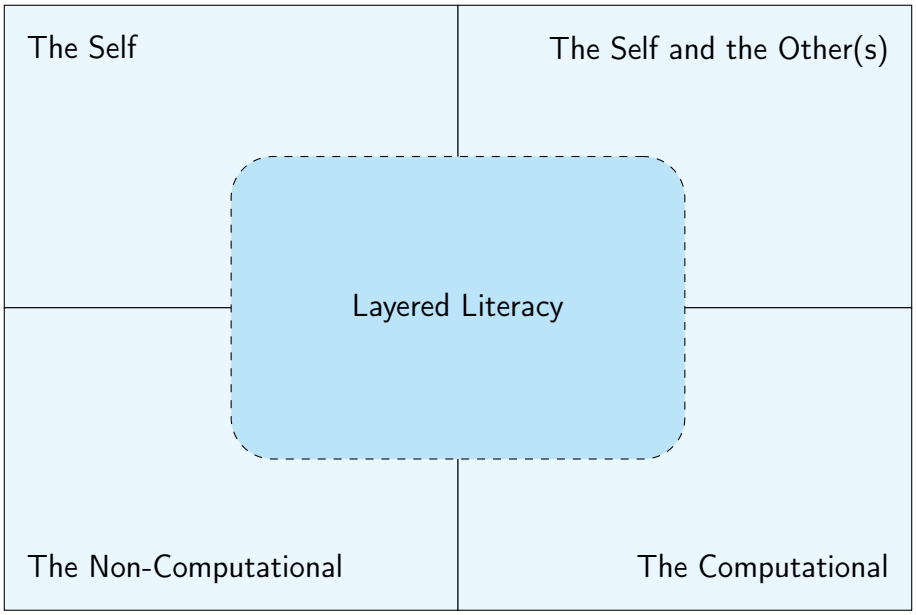
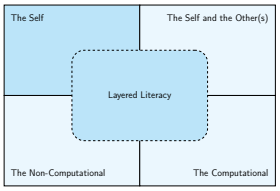


Figure 2.1.: Collaborative project activities in come_IN balance learning at four distinct yet interrelated ends to foster the building of a layered literacy.

computer clubs at the micro-level of the socially and culturally diverse neighborhood. This study discusses how this method can be a means to foster procedural, layered literacy among its local participants – taking into account both, the cultural as well as the computational aspects of (local) everyday life.

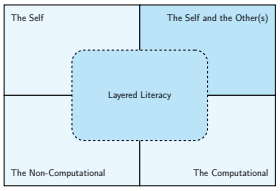
Intercultural come_IN computer clubs train for the application of cultural as well as digital and computational literacy by balancing both elements situated in the local context. With regard to collaborative project activities in the club, this implies varying degrees of movement and learning at four distinct yet interrelated ends (see 2.1): the *self*, the *self and the other*, the *non-computational*, and the *computational*. Collaborative computer club activity in come_IN adresses two or more of these ends simultaneously. Thus, come_IN seeks to train its young and adult participants in making informed choices when navigating cultural diversity and the analog and digital facets of everyday life.

2.3.1. The Self



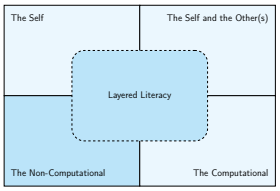
Here, the focus lies on identity: Who am I? It would be wrong to think that this question can be answered without the consideration of one's relations to other people – prominently among them parents and family, close friends and allies. However, the focus on the self in come_IN computer club activity aims to capture the moment *before* any kind of movement – towards or away from others - begins, as a result from learning.

2.3.2. The Self and the Other(s)



This aspect is following the bi-directional notion of identity development – the view that an individual can not only write but is written by culture in dialogue and interaction with others (see section 2.2.1 for a detailed overview). How do I position myself within the socially and culturally diverse local neighborhood? Collaborative project work in come_IN aims to create what Giroux (2007) has described as "alternative public sphere" to form and enact social identity in relation to others. It produces the "everyday encounters" (Irani et al., 2010, p. 1313) that are needed to foster and support this development.

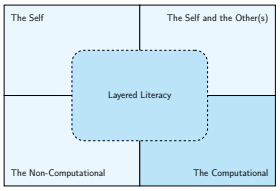
2.3.3. The Non-Computational



Here, the focus lies on individual skills and crafts, as well as neighborhood actions, activities and perspectives that do not contain a computational element. What are my inter-

ests? What are strengths and weaknesses? What do (or don't) I want to learn and do? Including a focus on the non-computational in the collaborative project activities in come_IN, grounds the understanding of the computer and ICTs in common everyday life, thus supporting their perception as tools for expression and creativity.

2.3.4. The Computational



Here, technology and the computational are in the focus as expressive tools to be creative about one's own development and learning, as well as about one's neighborhood surrounding. Computational thinking as a skill- and mind-set is approached from the local neighborhood level, taking into account its tangible, social as well as cultural dimensions in the sense of "connected learning" (Kafai and Burke, 2014).

Each of the subsequent chapters of this work provides a specific view on the interrelation of the above mentioned four factors. Discussing this from a perspective of procedural, layered literacies enables us to carve out the strengths and weaknesses of come_IN as a method.

Part II.

The Field

3. Setting

Each of the neighborhoods involved in come_IN comes with its own characteristics. Yet, they all share a common nature with regard to migration as a major driving force for social and cultural differentiation, and digitalization being the motor of profound societal changes, bearing great opportunities for many, but leaving others behind.

While taking a comprehensive look at the computer clubs' development and impact, this long-term study of the come_IN approach exemplarily takes a specific focus on the development of come_IN in one of the neighborhoods involved. This setting is described in detail in the following paragraphs.

The neighborhood in focus is located in one of the large cities in the Ruhr area in Germany. It stands out in the city because of its high population density: with regard to square footage it ranges among the smaller districts of the city, but with regard to number of inhabitants it is the most populous of the city's districts (Stabsstelle Dortmunder Statistik, 2016, p. 24). In 2016 the neighborhood sees the fourfold of the average population density of the city (ibid.). Dortmund Nordstadt exemplifies the phenomenon of "arrival cities" that Doug Saunders described in his analysis of migration movements and urban development worldwide (Saunders, 2011). In the city, the Nordstadt takes on the role of a neighborhood of arrival (*"Ankunftsstadtteil"*): Almost every third newcomer to Dortmund finds his or her first physical address in the Nordstadt (Staubach, 2013, p. 255).

The city has a history of coal mining and steel production; since the decline of these branches in the 1980s it still seeks to reposition itself as a base for IT and high-tech companies and small enterprises. Still resulting mainly from the shortfall of blue collar jobs, the unemployment rates in the neighborhood area are high, wages are low; access to higher education is often difficult.

Furthermore, the neighborhood stands out in the city because of the large number of families among its inhabitants, and because of its comparatively young age structure.

Currently, almost 70% of the population in Dortmund Nordstadt has immigrant backgrounds (Stabsstelle Dortmunder Statistik, 2016, p. 14). Migration has shaped the neighborhood in subsequent phases. The first phase began when industrial growth at the end of the 19th century demanded an increase in the workforce that could not be fulfilled with internal migration. About half a million people were recruited from Silesia, Posen and Masuria to move to the Ruhr area, with Dortmund within (Bade, 2000) Most of these migrants were German citizens, but Polish speaking (Cindark and Ziegler, 2016).

Another significant migration movement shaped the neighborhood's face from the 1960s to the early 1970s as part of the German "Wirtschaftswunder". So called "guest workers" and later on their families moved to Germany from Italy, Spain and Greece, Turkey, Morocco, Portugal, Tunisia and Yugoslavia in the 1960 and early 1970s to work in the coalmines and steel works. The name carries a major characteristic of this migration movement: it was initially thought to be temporary of nature – people staying for work on a temporary basis.

Immigration, especially from Bulgaria and Romania, has contributed to a significant population increase in the neighborhood since 2012 (Stabsstelle Dortmunder Statistik, 2016, p. 24). Research has identified poverty to be the main motor of this migration movement from Eastern European countries, and illegal prostitution, informal but publicly visible employment provisions, dependent contractor structures, and exploitative housing conditions being among the problems emerging in the receiving society (Kurtenbach, 2013).

The latest migration movement took shape just recently, when large numbers of refugees and migrants from Arabic and Eastern European countries (Staubach, 2013; Kurtenbach and Bogumil, 2014) came to the city, seeking for asylum and a new place to live. Refugees seeking shelter from war, violence, political unrest and oppression in large numbers in 2015 and 2016 found the city administration – just like many others across Germany – initially underprepared and underfinanced to supply the necessary everyday life support and housing to everyone (Nordstadtblogger, 2015). A large movement of voluntary help evolved during that time; many citizens were willing to provide help (Alison Smale, 2015). This help took the form of material donations, as well as time to provide language classes, leisure time activities for children, and accompany the newly arrived to necessary consultation hours with city administration offices and other bureaucratic steps in the process of seeking asylum and arriving in the new place. It blended in with existing professional as well as voluntary help structures that had formed throughout the city already but with a special focus on its northern part, the Nordstadt. Here, the concentration of many social and economic problems led to a lively help-yourself-structure of multiple local initiatives – voluntarily run as well as led by welfare organizations and churches or the municipality.

The result of these migration movements is what Vertovec has coined to be "superdiversity" (Vertovec, 2007): a population that is heterogeneous not only with regard to countries of origin, but with regard to legal status, transnational connections to the respective countries of origins, language, religious background, educational background and work qualifications to name but a few central factors.

All of the above sketched influences aggregate to a lively neighborhood, where many problems cumulate, but also a lively culture aiming to overcome these has developed over time. There are monthly neighborhood meetings that neighborhood managers have established for the various local groups to present their current activities and discuss local issues and conflicts; migrants would show up at the meeting, sometimes barely able to voice their requests in the new language, because they had heard by word of mouth recommendation that this was a place where help could be found. In those

meetings, discussion is fostered about problems and local issues such as littering on a large public square in in the neighborhood, or about drug use and drug dealing in public, and collaboratively actions are planned in response to that, such as writing a local petition to the police to have more patrols in a difficult area, organizing residential clean-up events to collect and remove garbage from public places, or raising awareness for difficult situations with the help of local news media.

Migrants and refugees themselves collaborate to create structures that would help them settle in their new home when they organized breakfast gatherings on a weekly basis to provide newcomers with an opportunity to get in contact with people from their respective cultural communities or countries of origin, as well as to find orientation and contact in their new neighborhood. Following a potluck structure, these gatherings take place at the local community center and bring together migrants and refugees by community, e.g. in a "romanian breakfast" or a "morrocan breakfast" – thus signaling a cultural focus, but always literally having an open door to anyone else who would like to join. Furthermore, women of various cultural backgrounds collaborate as so called "neighborhood mothers" and share their language and reading skills with other members of their cultural or migrant community, e.g. to handle administration letters and other organizational issues of daily life. Another example for less formal collaborations in the neighborhood are mothers in the Roma community teaming up to help each other bring their children into school and kindergarten, as well as raise awareness for the importance of continuous daily attendance. Local senior citizens organize a help-service, where former craftsmen provide household help fixing things for people who otherwise could not afford to pay for repair services. Here again, a community center functions as a local basis, where word of mouth can spread, agreements are found and appointments made. Also, citizens from the neighborhood regularly organize a clothing drive. To ensure, that everyone can accept the material help in dignity, the center set up a money box, so that can could be "bought" for a little symbolic amount of money.

Medical help is an urgent and very basic issue, especially among the migrants and refugees in this neighborhood, as many of the newly arrived citizens cannot (yet) rely on medical insurance. To meet this need, local doctors, nurses and midwives have teamed up in the neighborhood and offer medical treatment and advice for pregnant women and mothers of newborn babies at no cost in consultation hours in a monthly cycle. This low-threshold service too, relies heavily on word of mouth recommendation and a careful placing in a friendly, social atmosphere at a local community center.

Digital support structures have evolved as well, as (young) neighborhood residents collaborate to supply the local area with and spread the word about open wireless radio network service that is governed by a community organization and provides free internet access (so called Freifunk[1]). This service is especially directed towards the refugees and is well-received, as can be observed on online maps of local network nodes. The importance of a connection to and communication with family and relatives in the respective countries of origin has been recognized not only within research (Trimikliniotis et al.,

[1] `https://freifunk.net`

2014), but also in public discourse (e.g. Meyer, 2015).

4. Methods

This study of the intercultural computer clubs relies on a Participatory Action Research perspective. Participatory Action Research (PAR) aims to solve an immediate problem situation by designing and implementing actions and activities as a response, and then evaluating the effects of this action (Brydon-Miller, 1997; Racadio et al., 2014; Reason and Bradbury, 2001). The distinction between the researcher and the researched is decidedly challenged in this perspective, as the researcher herself is actively committed to engage in the field, and participants on the other hand are given the opportunity to "take an active role in addressing issues that affect themselves, their families, and their communities" (Brydon-Miller, 1997, p. 658). This research approach does make an explicit commitment to working with communities that are disadvantaged, or have been exploited and oppressed (Fals-Borda, 2001; Freire, 1970). It follows a circular pattern of planning, doing, observing and reflecting (Tacchi et al., 2003).

The close relation of the personal and the subject of study determines the structure of this chapter. First, the researcher's personal stance is described, and an account on her personal approach to and involvement in the setting is given. Subsequent sections lay out in detail how PAR's circular pattern of doing, observing and reflecting was implemented in the specific local, intercultural setting with the computer clubs in focus of this work.

4.1. Personal Stance

Being a member of the research team accompanying the works of the intercultural come_IN computer clubs, the author of this evaluation study has guided and accompanied the initiation process of several of the intercultural computer clubs. She has been involved in two of these computer clubs on a weekly basis since their inception, participating in their projects and activities as a tutor, thus providing help and guidance whenever needed. Personal involvement in the subject of study brings about an awareness for differences and similarities in perspectives and experiences. Being a resident together with her family in one of the neighborhoods involved herself the author shares a local view on everyday neighborhood topics with the computer club participants. Being a mother of two small children herself the author shares a local view on family life and related matters in the neighborhood with the mothers involved in the computer club's activities. Being a university graduate with a background in journalism studies, and holding a position as a research assistant, the author's work life perspective differs greatly from most of the adults involved in the computer club's project works.

4.2. Participation in the Local Intercultural Setting

First, there is the challenge of getting access to the field in the first place. Most likely coming from a different social, cultural and educational background, it takes time for the researcher to observe and understand the local field. It takes time to get to know local people and to establish a relation of trust, to enable participation in the local activities. Time is a central factor for this in the come_IN approach, with the computer clubs being setup with a long-term perspective, and in places that were previously identified as common ground in the diverse neighborhood setting (e.g. elementary schools or community centers). Collaboration with locals is another central factor: each of the computer clubs has a local carer, who acts as a person of trust in the local communities, advertising the computer club among neighbors, bringing current local topics and questions into the computer club project work, and "translating" misunderstandings among the different parties involved whenever that is needed. Participation in the local intercultural setting requires careful positioning in the field, not mistaking participating with making oneself common with the local community, whose experiences may be learned about but not necessarily be shared.

For the researcher in the local intercultural setting this process of positioning herself in the field also demands for a careful consideration, how common experiences or backgrounds, such as being a mother of small children or living in the same neighborhood, can ease the process of establishing a relation of trust. The come_IN approach responds to this by institutionalizing discussion rounds in the computer clubs, where all participants have an equal voice and are invited and encouraged to raise any subject that is prominent on their minds, and where mutual help and support is encouraged. The researcher in this setting is a listener and facilitator: carefully taking up the topics and questions raised, she can plan for information input as needed and direct questions to external local experts whenever necessary. Finally, participation in the local intercultural setting comes with the necessity to negotiate different values (e.g. with regard to gender topics), to discuss and to compromise. Here, it is a necessary pre-requisite that a common language is established. Regular discussion rounds are a central element in the come_IN approach to ensure this.

4.3. Action in the Local Intercultural Setting

Applying Participatory Action Research to the socially and culturally diverse local neighborhood comes with the need to prepare for a broad range of social and cultural factors, some of which are not visible at first sight. This entails the need to plan for unforeseen developments, where an action may have either resulted in a situation of conflict or triggered emotional or personal encounters. Each of the computer clubs has been established in close relation to a local institution where local experts are offering guidance and help (e.g. social counseling, social work etc.). It encompasses the need to establish a common

language with the local participants, so that different perspectives can be voiced, discussed and understood and compromises be found. It encompasses the need to acquire a profound knowledge of local experts and relevant local topics, and the ability to recognize one's own limitations – to see where the own expertise and skill as a researcher reaches its limitations and an issue needs to be handed over to an expert in the respective field. Finally, it demands for constant reflection. This is ensured by the come_IN research team in weekly meetings, where the team members discuss and reflect upon their own involvement in the computer club action. Furthermore, the team seeks regular practical as well as scientific exchange and discussion with external experts.

4.4. Research in the Local Intercultural Setting

Qualitative, largely observational methods (McTaggart and Kemmis, 1988), accompanied by occasional informal interviews and the analysis of the artefacts resulting from the collaborative project works in the clubs form the data basis of the evaluation presented here. Computer club sessions are documented in the form jottings, which are then completed to full field notes right after the session. The focus of these field notes lies on the interactions and collaborations of children and adults as observed in the club, on their appropriation of media and computer technology, and associated processes of learning, cross-cultural understanding and respect. To reflect upon their own role and active participation in the computer clubs, to avoid bias and enhance reliability, the come_IN research team has established weekly meetings. Here, the research team members discuss and reflect upon their own involvement in the computer clubs, plan and organize next steps. Furthermore, the group reflects its own doing on a regular basis in practical as well as scientific exchange and discussion with external experts.

The open structure of the concept requires a delicate balance of participation, action and research: where research needs may demand for the collection of e.g. participant data, the social structure of the club demands for a rather informal, low-key character of the sessions. The character of the computer club would be entirely different and participation much less lively (or cease entirely), if there were e.g. standardized questionnaires to be filled out for participants prior to entering a session. The open structure of the concept reaches its limitations in people's interest. Participation in the intercultural computer clubs is not mandatory, it has to be wanted – every week anew. Accordingly, the computer club initiators do not know who in the local intercultural neighborhood they do not reach and why. As participating tutors in the computer club the researchers can collect (good) feedback from the children and adults who join them there – but they will rarely know why people are turning their backs on the computer club. It is immanent to the close proximity of the personal and the professional inherent to the PAR approach, that the researcher is faced with the need to constantly balance how much individual self is revealed and put into the professional research situation. Finally, there are cultural barriers to participation, action and research that require perseverance and may even be unsurmountable. Again, a common language is central to enable development.

Part III.

Matters of Cross-Cultural Understanding and Respect

5. Extending Value-Sensitive-Design to Off-the-Shelf Technology: Lessons Learned from Local Computer Clubs

5.1. Abstract

Studying the setup and development of an initiative of computer clubs in intercultural neighborhoods, this paper builds on the theory and method associated with value sensitive design to account for the use of off-the-shelf technology in a diverse cultural context, and over an extended period of time. We present three cases from one of these computer clubs, each at a different point in time in the club's development. Central factors are identified that impact the course of a socio-technical initiative. We highlight the challenges inherent in matching existing ICT with the values both explicitly identified in the initiative and which evolve over time. Our study highlights the relevance of open communication structures among researchers and local practitioners, as well as methodological support that is needed to span a wide range of user experiences. Both aspects are key to making value sensitive design a lived experience on the diverse community level.

5.2. Introduction

"Unlike with people with whom we can disagree about values, we cannot easily negotiate with the technology", suggests Batya Friedman (Friedman, 1996, p. 21), grounding her argument that in the design of computer technology human values should be "understood from an ethical standpoint" (Friedman, 1996, p. 22). While conventional system design criteria such as usability, utility, reliability, efficiency and correctness are obviously important, a developing consensus has grown among system designers and researchers to the effect that attention to human values and their negotiations are needed as criteria for system design as well. Various approaches have been adopted over the years in relation to this ethical/political agenda.

Approaches range from the firm opinion that (social) science should and could be value-free (Weber, 1949), albeit value relevant, to the fundamental critique that there is no such thing as value-free or neutrality (Gouldner, 1962), and the development of a theory of potentially universal aspects in the content of human values (Schwartz, 1994). In a series of wellreceived works, Gouldner (1962) has critiqued the Weberian perspective

for its alleged appeal to reason and simultaneous ignorance of experience. In a debate spanning multiple scientific disciplines, qualitative researchers have, as part of this process, acknowledged a need for reflexivity. The influence of personal values and beliefs on the research process and research topic choices, culture or fieldwork site has been recognized (Lumsden, 2012), and emotional aspects of the researcher's approach to and involvement in the field have been discussed (e.g. Blackman, 2007; Kleinman and Copp, 1993; Van Maanen, 1988). In the context of design, Winner (1980) seminal "do artifacts have politics?" challenged sociological orthodoxy by asserting that material reality had, in some sense, a causal impact on social and political outcomes. As Winner suggests, social conditions may be required by, or strongly compatible with, the workings of a given technical system. If so, designers can be said to have some profound responsibilities, since almost by definition they are designing the social world in designing technology.

The responses to technicist orthodoxy include, for brief mention, participatory design, post-colonial design (Irani et al., 2010), co-design (Sanders and Stappers, 2008), critical design (Barab et al., 2004), feminist design (Bardzell, 2010), "design activism" (Fuad-Luke, 2013; Thorpe, 2007), reflective design (Sengers et al., 2005) and adversarial design (Marttila, 2011). Such perspectives all entail some commitment, then, to – at a minimum – skepticism about design neutrality or commitment to critical reflection and intervention in respect of the political/ethical landscape (Minoukadeh, 2011). We may see this overall as a challenge to the idea of an authoritative or neutral technical knowledge and a heightened sensitivity to the "rights" of various stakeholders both in terms of versions of "what goes on" and in terms of design decisions (Suchman and Jordan, 1997).

The matter of interest to us, however, is specifically to do with the application of the framework of value sensitive design. We do so because the framework offers an explicit commitment to the recognition of (often heterogeneous) values; it offers a methodological openness, and recognizes the iterative and negotiative way in which outcomes will be arrived at. Having said that, and as Le Dantec et al. (2009) have pointed out, the approach does entail some broadly unanswered questions. These, in our view, consist in the following:

Firstly, there are a number of unresolved questions concerning the nature of human values. Our engagement with value sensitive design seems particularly appropriate because, firstly, values or ethics – both concerned with fundamental principles of decent human conduct – nevertheless, seem to depend on situations. This insight has received attention in scholarly as well as popular discourse after British philosopher Philippa Foot formulated the "trolley problem" as a thought experiment in the late 1960s (Foot, 2002), initiating a "trolleyology" debate (Edmonds, 2013). Here, it seemed that decisions made about "the right thing to do" depended very much on the precise conditions in which choices were posed. Put simply, even when we accept the importance of values in our decisions, exactly how we are to think about our values and the situations in which they are manifested remains unclear. How values, including the explicit values that researchers or designers might begin their projects with, might be translated from abstract principles into pragmatic, situated stances, remains an issue.

Secondly, design is not always "de novo". Value sensitive approaches are scarcely alone in treating design in somewhat "umbrella" terms, as if the problem of arriving at designs which serve our needs does not in large part depend on what kind of design we are talking about. People may, for instance, set out to conceptualize and setup a technology-related endeavor without being in a position to start from scratch and build everything new, or to perfectly match well-defined demands. This is a necessary recognition of the fact that, often, ready-made technological devices are appropriated in design-related projects. It follows that an iterative approach to understanding "just how" technology is appropriated over time, and in relation to situated values, is needed. We feel that, as a theoretically grounded approach, value sensitive design theory is appropriate, while perhaps under-specified in relation to the kinds of design outcome that might be anticipated.

Thirdly, and as Le Dantec et al. (2009) have suggested, the very openness about method associated with value sensitive design may be, at least to a degree, problematic. There may be real methodological difficulties entailed in such work, especially in a long term, iterative, context such as the one we describe. The suitability of various methods may well, and we feel does, depend on the specific kinds of work being done and with the type of participants associated with it. The tripartite methodology associated with value sensitive design focuses on both directly and indirectly affected stakeholders and relies on an interactional perspective, in that it relies on "iteratively applied conceptual, empirical, and technical investigations" (Borning and Muller, 2012, p. 1125). It takes into account, in principle, the perspective of individuals who make direct use of a technology, as well as those individuals who are affected without being direct users of the technology. It sees technology development affected by individuals and social systems, and individuals and social systems as, in turn, influenced by technologies (Borning et al., 2005; Borning and Muller, 2012; Friedman et al., 2006). Having said that, exactly how these principles are to be applied, and in what contexts, continues to be explored. Recent works have critiqued and further developed this important area in HCI research, among them (Albrechtslund, 2007; Alsheikh et al., 2011; Cockton, 2006; Davis and Nathan, 2014; Huldtgren, 2015; Kummer et al., 2012; Le Dantec et al., 2009; Saab, 2008). LeDantec et al., in particular, argue that value sensitive design is perhaps too open about issues of method. Certainly, a more complete description of methods adopted and problems encountered would be beneficial for others embarking on similar projects.

Below, then, we focus on the development of the computer clubs that we initiated and continue to actively participate in, in intercultural neighborhoods. It is the overarching aim of these computer clubs to locally foster integration processes, as well as contribute to the closing of the "digital divide" (Wagner et al., 2002; Witte and Mannon, 2010). As the need to integrate migrants and refugees prevails in Germany among other countries across Europe and has experienced a new exigence with refugees arriving in large numbers (Frontex, 2016; UNHCR, 2016), the question is of great societal relevance, how enabling facilities in the local community can be created to support children as well as adults in low economic situations to learn about technologies and increase their skills and competences to make them part of the digital natives and improve their living situation.

Thus, we aim to shed light on the challenge of setting up a socio-technical initiative, when, to a large extent, off-the-shelf technology is implicated while, at the same time an explicit set of values are intended to be supported (Borning et al., 2005) in the respective project. By presenting three cases from one of these computer clubs, we carefully examine how values come to be deployed situationally, both with regard to the sociotechnical computer club design and the actual technology setup within them. That is, "design" here refers both the development of a desired cultural context and to the development of applications which might support our aims. In so doing, we detail the empirical processes that may produce practical results for researchers as well as local practitioners building on that commitment to value sensitivity. Below, then, we report on the way in which initial commitments to a value sensitive approach require translation over time and to a variety of stakeholders. In our study, we have focused on value sensitive design as a framework for understanding and organizing our experiences. It offers a clear commitment to building on expressed and explicit values, while at the same time recognizing their fluid nature among different interest groups.

This paper's contribution is threefold, based on the tripartite methodological structure of value sensitive design. First, we disclose challenges inherent to the conceptual negotiation of values among researchers, designers and practitioners as well as users on the local (neighborhood) level. Second, we demonstrate challenges immanent in the empirical process of determining an ideal socio-technical setup (Scacchi, 2004; Trist, 1981). Third, we highlight challenges inherent to the technical process of determining and setting up ICT that best matches the respective value(s) of the local initiative. An initiative that walks the line between "building-new" and matching off-theshelf technologies and social structures with a chosen set of values faces the constant need to coordinate and harmonize both sides – Millett et al. (2001) have pointed to this on an individual level in a study of web browser technology and its usage. Our study provides methodological implications for how to ease and foster this process on the community level, pointing to steps and actions that can be taken at the local community level to help to reveal the values of a given piece of existing ICT. With this, our study shows how specific instances of values being worked out are essential to make value sensitive design a lived experience on the local community or neighborhood level.

5.3. Related Works

Previous research in HCI has argued for a comprehensive approach to technology design, taking human values into account throughout the design process (Gilmore et al., 2008) – thus fostering the creation of computer technologies "we can and want to live with" (Friedman, 1996, p. 17). This in turn has supported numerous studies and analyses, applying the value sensitive design approach to various contexts, such as the workplace (Bødker et al., 2004), social needs (Le Dantec et al., 2009), and politics and participation (Borning et al., 2005). Our research grounds value sensitive design at the community level of a value-driven, socio-technical initiative by exemplifying the challenges inherent

in the setup and development of an intercultural computer club initiative. In this section, we examine prior work in value sensitive design and in computer clubhouses. We then discuss both areas in combination to lay the foundation for the research reported here.

5.3.1. Value sensitive design

"What does it mean to build things well?" is the question that value sensitive design treats as a central problematic. What are criteria that need to be considered? Key answers have been developed over the course of two decades, describing the approach to be primarily concerned with values of ethical significance, focusing on factors such as "human well-being, human dignity, justice, welfare and human rights" (Friedman et al., 2008, p. 87), but at the same time acknowledging that there can be great variation among values and how they come into effect in different cultures at different points in time (Borning and Muller, 2012; Friedman et al., 2008). Under the initial heading of value-centered design and then later as worth-centered design, Cockton made a further differentiation, distinguishing values rooted in moral considerations from those that center on "whatever some people somewhere value, individually or collectively, irrespective of ethics, wisdom, style, taste, etiquette or the approval of others" (Cockton, 2006, p. 167).

Further research focused on the voices and views of the users of a technology design (Borning and Muller, 2012; Miller et al., 2007), emphasizing the importance of what Borning and Muller, building on Lassiter (2005), call "sharing power between the researchers/designers and the users of the technology" (Borning and Muller, 2012, p. 1126). Yoo et al. (2013) have focused on the development of a design method to involve stakeholders untrained in design to center not only on the "form and function of a tool being envisioned but also on the social context of its use and values that lie with individuals, groups, and societies" (Yoo et al., 2013, p. 419).

It is this link that points to another central area in the discourse on, and development of, value sensitive design: method. Here, Le Dantec et al. (2009) as well as Woelfer and Hendry (2012) argue for specific attention to the methods applied, thus accounting for power differences between researchers and designers on one side, and users on the other side. In support of this stance, Borning and Muller make a claim for a "practice of self-disclosure" (Borning and Muller, 2012, p. 1130) on the side of the researcher and/or designer, where he/she is making themselves "visible" to the reader in their writings, disclosing information on their backgrounds, relation to study participants or relevant personal values – a practice that is common practice in writing ethnographies. Borning and Muller also argue for the enhancement of users" voices by means of a set of participatory methodologies allowing for a deliberate creation of documents (e.g. multimedia, photos, video) intended to serve as a communication means for certain values (Borning and Muller, 2012, p. 1131). Further research evaluates empirical methods with regard to their applicability to different values (Borning and Muller, 2012; Detweiler et al., 2012; Friedman et al., 2006; Iversen and Leong, 2012). Our work with intercultural computer clubs in local neighborhood communities builds upon these arguments in that it relies on

a participatory action research perspective (McTaggart and Kemmis, 1988). Thus, there are methodological consequences to the recognition of the fact that the structure of local (neighborhood) communities is – albeit an overarching shared and collective identity may exist – diverse and complex, and constantly changing (Racadio et al., 2014).

The above discourse in turn points to another key question: who sets values, and are there universal ones? Borning and Muller provide a valuable overview of this discourse in value sensitive design (Borning and Muller, 2012, p. 1126). With their study of a computer simulation of urban development, Borning et al. (2005) have provided the basic distinction among (i) explicitly supported values, (ii) designer values and (iii) stakeholder values (Borning et al., 2005). Shilton et al. have developed a framework enabling the separation of "dimensions that pertain to the source of values (state, unit and assemblage)" from "dimensions that pertain to attributes of values (salience, intention and enactment)" (Shilton et al., 2013, p. 260), thus enabling more precision and comparison when describing "where and how values are negotiated and enacted by people, institutions, and technology" (Shilton et al., 2013, p. 260). Again, the turn towards action research proves to be helpful here, in that this methodological commitment emphasizes the transformative power of the community members themselves. Following the critical pedagogy of philosopher Pablo Freire (Freire, 1970) and sociologist Orlando Fals-Borda (Fals-Borda, 2001), research in this tradition originally aims to address developmental challenges in communities that stem from the immoderate influences of globalization (Racadio et al., 2014, p. 50). The role of researchers as well as local practitioners in this tradition is seen to be educating and supportive to the community needs, but the transformative change ultimately needed to develop from within the community members (Brydon-Miller, 1997; Racadio et al., 2014).

The question of the universality of values, as well as the ability to talk about them with precision and clarity, is of special relevance in cross-cultural contexts. Comparing perceptions of privacy in public places in Sweden and the USA, Friedman et al. have explored what values might carry across cultures, and discussed where and how variation may exist (Friedman et al., 2008). Alsheik et al. argue for a design that is not only sensitive to values but also allows for the enactment of "particular cultural roles" (Alsheikh et al., 2011, p. 83). In the local neighborhood setting of our intercultural computer clubs, the views described above are of special relevance as they point to a central issue, that of how the explicit values of a project team are negotiated (explicitly or otherwise) with the perspectives of multiple stakeholders from various social, economic and cultural backgrounds. In this diverse local setting, the challenges for appropriating off-the-shelf technology from a value sensitive design perspective are concerned with identifying the values involved, in a context where the articulation of those values may be easier for some than for others. Equally important for an initiative that is walking the line between "building-new" and matching off-the-shelf technologies and social structures with a chosen set of values, a key challenge lies in the fostering of a local dialog for the management and negotiation of the values at stake, and a better understanding of how technology may intervene in that process.

5.3.2. Computer clubhouses

Intercultural computer clubs in Germany developed from an initiative by our research team. They focus on the values of crosscultural understanding and respect. These values have evolved as part of a larger societal debate on migration (Klopp, 2002; Schuck and Münz, 1998). They form the mutual, bi-directional foundation for the integration of society's mainstream and immigrant groups, with cross-cultural understanding forming a needed underpinning for respect. The values of cross-cultural understanding and respect are rooted in the German debate on multiculturalism (Schuck and Münz, 1998), where integration, as discussed in academic, policy and public forums, has two dimensions. Firstly, the structural dimension is concerned with equal access to all parts of societal life, such as justice, governmental institutions, education, labor, standard of living, social security. Secondly, the cultural dimension, deals with a common basis for living that is based on common language, core values, common rules and respect for and knowledge of social and cultural differences. This is where the values of cross-cultural understanding and respect have their roots.

Initiated explicitly to foster these values at the local level of socially and culturally diverse neighborhoods, the clubs offer a space for the computer-related collaborative practices of these neighborhoods" mainstream and immigrant groups (Rode et al., 2015; Schubert et al., 2011; Stevens et al., 2005; Weibert and Wulf, 2010; Weibert et al., 2014). The computer club initiative is able to speak to the structural dimension of the above sketched integration processes by broadening access to information on and participation in several parts of public life – among them most prominently the job market. It addresses the cultural dimension by providing immigrant and mainstream societal groups a tool to create and share mutual knowledge, compromise and negotiate differences, at the same time helping immigrants to keep up a remote relationship, and hence a stable identity, with their respective home countries. This remote relationship becomes visible in computer club project work, where participants frequently enjoy expressing their respective origins, e.g. by designing figures or artefacts in the colors of their home country's flags, or by involving traditional patterns, language or music, whenever a project activity allows for that. Furthermore, this remote relationship shows, when participants enjoy to look at their home countries and home towns or villages on google maps. Based on an explicitly open structure, the intercultural computer clubs in Germany provide open, yet guided, access to ICT for children and adults alike, aiming to foster community dynamics and the strengthening of social ties – on the family, school and neighborhood level. The computer club initiative has existed for more than ten years now, and the network grows, with six clubs in various cities in Germany (Weibert et al., 2015, 2016). Two clubs in Palestine have become part of the network more recently (Aal et al., 2014). The study presented in this paper focuses on one of the clubs in Germany.

The computer clubs' commitment to the explicitly supported values of cross-cultural understanding and respect entails specific structural implications. For one, participation in the clubs is voluntary and free. Topics for project work in the club are developed by

the child and adult participants themselves and then jointly agreed upon. Tutors and a teacher provide help and guidance but do not set up a predefined schedule to follow for the clubs' weekly meetings. Most of the clubs are located in elementary schools in intercultural neighborhoods in Germany – institutions that are common ground for people of otherwise often different backgrounds (e.g. economic, educational, migration).

Furthermore, a basic rule for the computer clubs' weekly two-hour meetings is that children should participate together with a parent. This rule became more flexible after a while – children who could not join the club together with a parent (because parents had to work during club time) were encouraged to join the computer club together with another adult family member or friend. The general idea behind this: to use project work in the clubs as a trigger for intergenerational learning experiences that ideally find their continuation in family and neighborhood contexts. Also, project work in the club is conjointly decided upon. This may result in larger projects involving all club participants, as well as smaller activities being conducted in parallel and involving fewer participants. To plan and coordinate all club activity, an opening and closing discussion round was established. Ideally, one child and one adult per session team up and jointly moderate these rounds to ensure that voices of children and adults are equally heard. In order to make ideas accessible for later times, some computer clubs keep a wooden "treasure box of ideas" where participants write project plans and ideas for activities on paper cards.

With this structure, the intercultural computer clubs build on the US computer clubhouses' principles of situated learning (Lave and Wenger, 1991) and constructionist thinking (Chapman, 2006; Resnick and Rusk, 1996a). In the USA and elsewhere, these clubhouses have opened up many opportunities for disadvantaged inner city youth since the first club was established in Boston in 1993. Their structure and success is well documented in research (Kafai et al., 2009; Michalchik et al., 2008; Resnick et al., 1998). Their main focus lies on the development and strengthening of individual skills, confidence and creativity for disadvantaged inner city youth. We build on these principles but, in addition, our clubs are founded on explicit values, as already stated, on the part of the clubs' organizers of cross-cultural understanding and respect. The clubs are especially interesting as a setting to contribute to value sensitive design's further development. This is the case because the design of the club's structure and its development point to the necessity of providing for values in the context of constant change and development. Also, the clubs exemplify the constant trading off of "building-new" and selecting among different existing technologies in order to meet a specific set of values – thus serving as a blueprint in terms of methodological procedures. Our focus includes both the overall design of the computer club as a socio-technical initiative, as well as the inherent technology choices (involving the pondering of building-new against appropriating off-the-shelf technology).

5.4. Methods

The tripartite methodological structure that Friedman and colleagues have established (Friedman et al., 2002) and others have built upon, e.g. by promoting principles of action research (Hayes, 2011) for value sensitive design informs our general project setup. Our research team has conducted (i) conceptual investigations into what constitutes and promotes cross-cultural understanding and respect on the local level of socially and culturally diverse neighborhoods in Germany. This laid the grounds for the socio-technical computer club design. Our conceptual investigations explored, how local stakeholders would be socially impacted by the envisioned initiative. Following up on this, (ii) empirical investigations were made to determine how collaborative project work with computers and other modern media can support these values, cross-cultural understanding and respect, on the local neighborhood level. And (iii) our research team has conducted technical investigations to guide the actual technology setup.

5.4.1. Researcher stance

The three members of the research team who initiated and worked with the computer club we describe here combine expertize in computer science, journalism and media studies. As a resident in the neighborhood herself, one of them also brings in several years of local knowledge of the quarter where the computer club is located. Two of the researchers are male, one is female. Being a mother of two children in the respective neighborhood turned out to be a factor that eased the establishment of relations to especially the women participants in the computer club for the female member of the research team. One of the male researchers has an immigrant background himself (Russia), which also prove to be a factor facilitating trust building. All three researchers have several years of experience, working with computer clubs.

Our qualitative study focuses on one of the six intercultural computer clubs in Germany, active at the time of this writing. It covers its entire lifespan, from 2009 to date. Thus, it provides a long-term, in-depth picture of its strive to locally foster integration processes, as well as contribute to the closing of the "digital divide" (Wagner et al., 2002; Witte and Mannon, 2010) and identifies enabling conditions and challenges associated with such value-driven work. However, this focus on just one club is not arbitrary. We carefully set our focus on this specific computer club, after we had assembled the structural characteristics of all intercultural computer clubs in Germany (Table 5.1). Thus, we were able to identify common characteristics as well as differences and make sure the research site chosen was representative for the overall research question of our study.

Computer Club A is located in an elementary school in one of the large cities in the Ruhr Area in Germany. It is based in a neighborhood that is notable for a high population density, large number of families, comparatively young ages of its inhabitants, and its cultural diversity (about 58% of the neighborhood population has an immigrant background). In these neighborhoods, high unemployment rates, low wages and other

Club	City	Location	Participants	Cultural/migration background	Session frequency and structure
A	Mid-size town in the Rhineland Area	Elementary School	2-4 adults, 10 children	Resembling the diversity of the neighborhood: Mostly Turkish and German	Weekly 90 minute sessions; voluntary
B	Mid-size town in the Rhineland Area	Grammar School	6th grade; one entire class of 30 students	Resembling the diversity of the neighborhood: Polish, Russian, German, Turkish, Iranian, Iraqi	Weekly 90 minute sessions; mandatory for the children; part of the official school curriculum
C	Large city in the Ruhr Area	Elementary School	5-8 adults, 11 children	Resembling the diversity of the neighborhood: Albanian, Macedonian, German, Moroccan, Tunisian, Turkish	Weekly 90 minute sessions; voluntary
D	Large City in the Ruhr Area	Community Center	10 women, 5-6 children	Resembling the diversity of the neighborhood: Mostly Bulgarian, Moroccan, Romanian, Syrian, Turkish	Weekly two-hour sessions; voluntary
E	Mid-size town in the Siegerland	Elementary School	7 children, 2-4 adults	Resembling the diversity of the neighborhood: Russian, Palestinian, Turkish, German	Weekly 90 minute sessions; voluntary
F	Mid-size town in the Siegerland	Compre-hensive School	20 children	Resembling the diversity of the neighborhood: Polish, Russian, German, Turkish	Weekly 90 minute sessions; voluntary

Table 5.1.: Structural characteristics of intercultural computer clubs

Background	Children	Parents
Albania	2 (f/m)	–
Macedonia	1 (m)	1 (f)
German	2 (f/m)	1 (f)
Morocco	2 (f)	2 (f)
Tunisia	1 (m)	1 (f)
Turkey	3 (f/m/m)	3 (f)

Table 5.2.: Participants and their migration backgrounds – 2009 (Cases I and II)

Background	Children	Parents
Albania	2 (f/m)	–
Macedonia	1 (m)	1 (f)
German	2 (f/m)	–
Tunisia	1 (m)	1 (f)
Turkey	4 (f/m/m)	2 (f)

Table 5.3.: Participants and their migration backgrounds – 2013 (Case III)

obstacles that make access to higher education difficult are prevalent. Almost every one of the 270 children in the elementary school is bilingual, with Arabic, Albanian, Polish, Russian and Turkish being the most common languages. The school provides a number of activities for parents, and most particularly mothers; these include language classes and a "parents' café".

Club A was founded in 2009. Neighborhood inhabitants, local elementary schools, a local nonprofit organization and neighborhood managers worked together to bring the computer club to life. The immigrant backgrounds present in the club mirror the diversity of the surrounding neighborhood, with children and adults stemming from Albania, Macedonia, Morocco, Tunisia and Turkey. From the outset, curiosity about the new opportunity and demand for participation was high, so the club established a waiting list and has maintained it ever since. In the early years there were seven to ten children and five to seven adults participating in Club A every week. Due to changes in the schools' timetable, adult participation temporarily ceased and only the ten children took part in the club for about half a year in 2012.

The computer club undergoes a major change of participants every two years when children – usually joining the club as 2nd graders around the age of 7 – leave elementary for secondary school as 4th graders. Accordingly, at the time of writing, club A has seen a total of about 60 participants since 2009 (Tables 5.2 and 5.3).

5.4.2. Data collection

In virtue of the fact that the researchers engaged in the reflections, we detail here are also the people who are organizing the club activities, and given that the activities and reflections upon them are geared to the problem of change, it makes sense to describe the work in terms of a participatory action research perspective (McTaggart and Kemmis, 1988). The research project that accompanies the intercultural computer clubs in Germany uses qualitative methods, largely observational, though accompanied by occasional informal interviews. Such observational work, in company with action research, has been described as, "ethnographic action research" (Hartmann et al., 2009; Tacchi et al., 2003), and relies on field notes and transcripts that members of the research team have taken from the clubs" weekly meetings. Such an approach covers both elements of description and commitments to intervention. Research team members are active participants in the computer clubs and routinely act there as tutors. Their guidelines for note-taking during the club sessions set a focus on the observable collaborations and interactions of children and adult club participants, their appropriation of media and computer technology, and associated processes of learning, cross-cultural understanding and respect in jottings which are completed to full field notes right after the respective club session. Photos are part of the documentation process as well, they are taken during the club sessions to keep record of key scenes and central developments of the computer club activities, and are included in the full field notes.

To reflect upon their own role and active participation in the computer clubs, to avoid bias and enhance reliability, the research team has established weekly meetings. Here, the research team members discuss and reflect upon their own involvement in the computer clubs, plan and organize next steps. In so doing, the team is institutionalizing what Marcus (2007, p. 355) has called "the process of making knowledge out of the traditional individual, case-bounded project of fieldwork" in their work as a research group.

In turn, the interventionist stance does not mean being directive. Instead, a commitment to participation is also part of the approach. It lies in the nature and aim of the intercultural computer clubs that the action research perspective also entails participation in elements of design. Muller, building upon Bunch (1987), states how it "takes work, and new ways of thinking, and new kinds and methods of openness, to bring substantively new voices into a conversation." Similarly, to bring users' knowledges and perspectives directly into computer specification and design, it is necessary to do more than "just add users and stir" (Muller, 2003, p. 3). Transferring this insight to the socially and culturally diverse local neighborhood setting where the fostering of integration processes as well as the bridging of the "digital divide" and an increase in computer literacy is the aim, it takes more than "just add technology to people's lives and stir".

Not being in a position to start from scratch and build everything anew, the technology-related initiative we describe often walks a fine line between appropriating ready-made technological devices and building things anew. This requires inclusion of a participatory design perspective (e.g. Druin, 1999; Muller, 2003; Schuler and Namioka, 1993) that

Total	**Case Study I**	**Case Study II**	**Case Study II**
∼300 hours of observation	∼40 hours	∼96 hours	∼12 hours

Table 5.4.: Data overview and case study data subsets

involves local stakeholders in the development and design of a needed piece of technology in the computer club as well as the surrounding and supporting social computer club structures.

Field notes form the basis of the analysis presented in this paper. Those notes have been taken by three members of the research team who routinely acted as tutors in the club. After each club session, those notes have been documented in form of a protocol. They include key verbatim statements of club participants and their general focus is on the interactions and collaborations of children and adults as observed in the club. They focus on the appropriation of computer technology and media, and the organization and progress of project work in the club. The time span covered in the analysis presented here includes the planning phase of the club in early 2009 as well the entire lifespan of the computer club to date (Table 5.4). As clubs do not meet during school holidays, this accounts for about 30 field note protocols on around 48 hours of computer club session per year.

5.4.3. Data analysis

Coding of material (Lofland and Lofland, 1995; Strauss and Corbin, 2004) was guided by our focus on the setup and development of a local intercultural computer club as a valuedriven, socio-technical initiative. Following the tripartite methodological structure established by Friedman and colleagues (Friedman et al., 2002) in our coding process, we, the three researchers, explored the challenges that may occur on the *conceptual, empirical* and *technical* levels, when a valuedriven initiative walks the fine line between matching existing technology with its implicit values, and designing technology anew to meet its needs.

In a first step, we read through the data to identify key junctures where critical decisions were made about technology use. These in hand we did a comprehensive coding of those three cases: (i) the initial planning and setup of the computer club, (ii) the new design of a club community platform and (iii) the appropriation of pre-existing hardware. With this, our focus in coding was on how the beforehand identified specific instances of values are being worked out on the local level. Coding for all cases was iterative and continued until no new themes emerged. With a *conceptual, empirical* and *technical* focal point, it was informed by the tripartite methodological setup of value sensitive design (Friedman et al., 2002).

Our data yielded codes that included access, continuity, cultural background, education,

Dimension	Case I	Case II	Case III
Purpose	Computer Club Set-up	Community Platform	Hardware
Year / Duration	2009 / ¾ year	2009 / 2 years	2013 / six weeks
Stakeholders	• Children • Parents • Teachers • Researchers • Local Practitioners • Local Residents	• Children • Parents • Teachers • Researchers • Designers	• Children • Parents • Teachers • Researchers
Technology	Off-the-shelf	New Design	Off-the-shelf

Table 5.5.: Overview on the characteristics of the three case studies

feedback, gender, language, learning, transparency, trust. Building on the work of Borning et al. (2005), we analyzed (i) explicitly supported values, (ii) designer values and (iii) stakeholder values, thus carving out key factors that may serve as a set of guiding principles to make value sensitive design a lived experience on the local community or neighborhood level. We revealed five main themes that we isolated, *Communication Practices, Common Language, Diverse Stakeholder Backgrounds, Divergent Underlying Stakeholder Values* and *Social Setting*.

5.5. Three Case Studies: Setup, Design and Appropriation

In this section, we describe the setup and outline our findings for each of the three cases seen in the computer club at different stages (Tables 5.5 and 5.6). The first case study entails the initial setup for the computer club; the second and third studies provide contrasting cases between the design of a new technology by and for the community and the appropriation of pre-existing technology to meet an identified community need. We chose to analyze these three cases as a means to grasp the full picture of what it means to employ specific instances of values at the local community level, and how these instances reflect contingent and specific factors.

5.5.1. Case study I: planning and setup of the computer club

Case study setup I

The first case study entails the initial setup for the computer club. When the computer club was planned and established in 2009, the research team had garnered five years of

	Conceptual challenges	**Empirical challenges**	**Technical challenges**
Case I: Computer Club Set-Up	• Great disparity in the underlying values of the stakeholders. • Divergent social and educational backgrounds.	• Ensuring transparency and levelling of powers among the stakeholders. • Clear communication practices. • Maintaining a constant close attention to local stakeholders.	• Need to rely on given hardware and OS. • Simultaneously pay attention to the development or introduction of ICT and to the structuring of its social setting.
Case II: Platform Design	• Managing co-evolution of ICT and organizational policy. • Divergent social and educational backgrounds involved.	• Ensuring there is a common language among all stakeholders to talk about the technology and related learning experiences. • Ensuring there is ample and continuous room for feedback.	• Make values immanent to a design process be clear and understood by all involved parties.
Case III: Appropriation	• Divergent social and educational backgrounds involved. • Embedding ICT in an appropriate social (project) structure.	• Ensuring there is a common language among all stakeholders to talk about the technology and related learning experiences. • Ensuring there is ample and continuous room for feedback.	• Make values inherent to a pre-existing piece of technology be clear and understood by all involved parties.

Table 5.6.: Overview on conceptual, empirical and technical challenges in the three cases

experience with the establishment of computer clubs in other neighborhoods. In a first step, it advertised the club in several meetings with so-called neighborhood managers (social workers and urban planners, employed to improve the living conditions in troubled suburbs and inner city neighborhoods), local elementary school teachers, the inhabitants of the neighborhood, and a local nonprofit organization. Researchers described the basic idea of the computer club as an openly structured place for guided exploration of computer technology, and for collaborative, computer-based project work on topics of local relevance. Interest in the project was high, and soon the next phase of concrete planning was entered.

An elementary school located at the central market square of the neighborhood committed itself to hosting the club in its building. Headmistresses of two other elementary schools in the neighborhood showed disappointment that they were not involved in this first setup of the computer club, but said that they would keep an eye on its development in order to possibly join in later and copy the concept in their schools. So, when the school which had initially committed itself to hosting the club had to step back from this commitment due to a staffing shortage, one of these other two elementary schools stepped in at relatively short notice and incorporated the computer club into its afternoon activities. Local teachers from the different schools resolved this issue themselves before members of the research team even needed to adapt to a new location – an indicator that the computer club idea which was brought to the neighborhood by the research team already carried with it some implicit values already held on the part of teaching staff.

A local nonprofit organization had also committed itself to the computer club project and in several subsequent meetings its members worked with members from the research team to apply for funding for the ICT needed to equip the club, and to collect project ideas that would possibly appeal to the prospective club participants and their everyday neighborhood experiences and needs. The nonprofit organization also engaged in collecting used computer hardware for the club. Neighborhood managers advertised the club in neighborhood meetings. Here, the proposal was received with great interest, and numerous adults expressed their ideas to researchers on how the computer club might match their everyday needs. Members of the nonprofit organization had designed a poster for the club, and a few weeks before the official club start this poster was on display in shop windows, showcases and bulletin boards around the neighborhood. One member of the nonprofit organization, who also lived in the neighborhood himself, decided that he wanted to contribute to the new computer club as a tutor.

Findings I

Our study found the planning and setup of the computer club to be characterized by a great disparity in the underlying values of the various stakeholders. It is not entirely surprising that these values are embedded in perceived needs. Table 5.7 presents something of the disparity between (i) members of the research team, (ii) teachers, neighborhood managers and members from the nonprofit organization as local practitioners and (iii)

Direct Stakeholders	Indirect Stakeholders	Stakeholder Values
Researcher		• computer-related collaborative project work to foster interaction and communication across cultures and generations
Child		• access to IT equipment • individual play
Adult		• guided access to IT equipment
	Adult (male/migrant)	• confounding of traditional gender roles
Teacher		• computer club as additional bonus in the school's program • contribution to the school's image as an open and locally engaged place • computer club as a means to reach out to parents
	Local Practitioner (school administration, neighborhood managers, members of the non-profit organization)	• local networking • interaction and communication across cultures and generations • development of neighborhood as a lively place

Table 5.7.: Case study I: Manifestation of values in the different stakeholder groups

neighborhood inhabitants as prospective computer club participants.

Members of the research team already had several years of experience in putting computer club projects into local contexts, so they moved ahead quickly in the installation of the computer club in this neighborhood. They were able to identify important contact persons on the local level, and were also able to anticipate administrative barriers on the practical level (e.g. structural conditions of the room for the club, fundraising for IT equipment).

Neighborhood "officials", such as teachers in their role as members of the school's administration, neighborhood managers and members from the nonprofit organization, in turn, displayed a certain attitude concerning anticipated benefits in putting a project of this kind into practice as well. Typical statements from informal local meetings illustrate this:

Teacher: *"Especially including and addressing the parents is very valuable to*

us as a school."
Neighborhood manager: *"I can totally see our older people here like this – as many of them do not have access and help with regard to computer matters."*

Teachers as members of their school's administration, neighborhood managers and members from the nonprofit organization, having recognized, from their point of view as local practitioners, what benefits might accrue, provided practical support by contributing to fundraising matters and to the search for an appropriate location. As indirect stakeholders, they viewed and understood the club as one contribution to the neighborhood's general development and improvement. The prospect of a low-threshold service inviting the participation of potentially all of the different residential communities in the neighborhood fitted with their general desire to establish a lively and engaged diverse neighborhood community. Here, *participation* as a value in the abstract translated to local networking and to interaction and communication across cultures and generations, and it was seen as a necessary step towards integration in the community. This general commitment by teachers, neighborhood managers and members of the nonprofit organization meant that initial problems, such as when the school that had committed itself to hosting the club had to limit involvement with the project (due to an unexpected staffing shortage) were quickly overcome. In terms of general values, it seems there was overall support for what was seen as a "good cause" but it should also be recognized that the computer club and its smooth local installation shed light on the general work of neighborhood managers. It contributed to the image of the local school as a lively, locally engaged place, and also involved the chance to benefit from the technology-related expertize of the research team members. Furthermore, the schools voiced their interest in the additional resources in form of IT equipment that the installation of the computer club in their facilities would bring along – presumably also for others in the school to benefit from (A teacher from the school's administration: *"We don't have a dedicated computer room now – so of course this project would be beneficial to us as an institution, too."*).

Teachers involved in the running of the computer club as direct stakeholders also saw a social advantage, recognizing the proposed club as an opportunity to reach out to parents and provide them with opportunity for informal talk about their children's progress in school, as well as hear about what was on their minds in general. *"In the club, we can meet and talk on a level that is more casual, and thus different from the classroom situation,"* a teacher describes. This, she explains, is a valuable opportunity to communicate with parents who are educationally disadvantaged and hesitant to reach out to the school and the teachers themselves: *"It helps the kids get along, too."*

Neighborhood inhabitants as prospective participants, of migrant and non-migrant backgrounds alike, understandably took a rather down-to-earth approach to the proposed project, grounded in the possibility that it might help them with specific problems they encountered. So when the computer club was introduced in neighborhood meetings, inhabitants were seen to "translate" cross-cultural understanding and respect to everyday meanings: to many, the proposed club idea first of all implied access to IT equipment

Figure 5.1.: To neighborhood inhabitants the computer club initially meant access to material resources and guidance.

along with some guidance (Figure 5.1) – and thus respect for the problems (often IT-related) they were facing in their lives. Writing a letter to public authorities in correct style and formatting, searching for information on the internet, distinguishing the reliability of an online source, protecting one's online privacy were but a few of the issues that came up in the local discussion rounds with inhabitants. And the computer club was perceived as a lowthreshold solution to these problems. Two female residents (no migration background) described this as follows:

> Woman 1: *"There are courses, I know. But I feel I cannot just go there and know nothing about anything at all."*
> Woman 2: *"Yeah...* (laughs) *We're slow, you know?..."*

This dialog illustrates how in the eyes of the neighborhood residents, the computer club carried with it the genuine possibility of participation without embarrassment. The idea of a place where it was OK to be all of the above: not knowing, and possibly slow in learning – where access to IT came along with individual guidance – was immediately attractive. The computer club idea provided the prospect of regular participation in those parts of everyday life that had remained inaccessible due to lack of IT-related skills and knowledge.

Some women of Muslim background added another dimension to the issue of access, when describing how they frequently stand behind their husbands and sons when it came to access to the family PC or laptop.

Behind this initial resident feedback was also the issue of money: neighborhood inhabitants knew that there were courses one could take to learn all this – *"but I don't have the money to pay for one of those,"* is how a female resident with a Turkish background put it. Since members of the nonprofit organization had collected used computer hardware for the proposed computer club to start a project with, and learn about, IT in a hands-on

manner, neighborhood inhabitants with and without migrant background alike were seen to be enthusiastic about access to this resource which came to them at no cost.

However, seeing a practical advantage does not immediately translate into long-term commitment. To maintain confidence, various aspects of relationships needed to be managed. Social support, for instance, was indispensable for the members of the research team to convey this enthusiasm for committed participation in the club's activities. To the research team it was a given that any educational background was welcome to participate in the club. But they learned that on the part of some of the adult participants there was an initial reluctance to show an actual or perceived lack of knowledge. A prominent topic, where this played out, was writing. This is a skill that is evidently needed for many IT-related activities. But among some of the migrant adult participants, writing skills were not very advanced – a factor they initially were hesitant to display in front of the researchers as well as in front of the children. *"You can do that,"* one of the (migrant) women in the club would initially say, whenever it came to, e.g. typing a word into a search engine on the internet. It was the open computer club structure that made those participants discover over time that "not knowing" carried no disapprobation, as this was happening to everyone (including the teacher and the researchers as tutors) in the club. Tutors would ensure that help was provided when needed, but in a way that made the participants discover the solution themselves. (*"See: you click here. Then you can type. Once you're done, you click 'OK'."*)

There was no questioning of the computer hardware that was initially available for the computer club to work with. Tutors and teachers, children and parents just started the club with the material available to them. And this, it turned out, implied a significant amount of freedom as well: the freedom to take a piece of technology apart and explore it from the inside. *"This really gave me confidence"*, says one of the Muslim women in the club in retrospect about one of the first computer club activities, where the women took a computer apart, studied its components and functionalities and put it back together again to be used in the club as the "mother's PC" from that day. *"Edubuntu, Windows, Mac... before I came here, I had no idea..."*, said another woman about the variety in operating systems (OS) that she had explored and learned about in the club. Again, a link to gender issues is apparent, when especially women of migrant backgrounds showed they valued the regular access to computer hard- and software. *"At home that is a man's thing"*, as one of them puts it. Here, values of non-participating (migrant) men became indirectly visible, indicating access to and knowledge about computer technology to be predominantly male, and not a matter for the woman in the family.

The children, too, were content with the given computer hardware. Still being at an early stage in their careers as learners and users of technology, they were not yet accustomed to a specific OS or hardware and took the opportunity to, for instance, play games on whatever hardware and OS that was available. *"Let's just play!"*, as one of them said.

5.5.2. Case study II: new design of a club community platform

Case study setup II

Our second case focuses on the design of a new technology by and for the community. As the computer clubs grew into a network of six clubs in different cities in Germany, and two clubs in Palestine as well as cooperation with clubs in the USA, the need arose to connect these clubs and their participants' activities via an online community platform. It was anticipated by the members of the research team, that the computer clubs and their participants would mutually benefit from their respective – distinct yet in many ways similar – experiences, and from the opportunity to communicate and share skills and ideas online.

First inquiries among club participants showed that existing, commercial community platforms and online networks like Facebook[1] or meinVZ[2] were perceived with a good deal of distrust, especially among participating teachers and adults in the club. Parents in particular voiced concerns with regard to privacy issues. Also, existing technologies did not lend themselves to the abilities and needs of younger children. In consequence, the research team set out to design and built a new club community platform. This was done through an iterative process, simultaneously involving children and adults in several of the computer clubs.

This design process involved continuous observation by members of the research team, with a view to identifying the problems and needs that children had during the course of their activities during club sessions. Not least, it was clear that the youngest children had not yet fully developed their reading and writing skills. Therefore and to meet the need of all ages the platform had to consider technical fluency, reading capabilities, and the shorter attention span of younger children.

The privacy concerns mentioned above meant that only computer club participants could have a profile on the platform. It remained closed to the outside online world. Activities of club participants are supported by means of functions for communication and shared practice such as a digital newspaper for each club, where club participants can inform others about their latest activities. A club "internal blackboard" supports the collaborative project workflow: here, each club can announce and keep track of the sequence of project actions. The platform provides a computer club search facility where participants can search for similar documents and projects to become inspired or use it for an idea of their own. To avoid unwanted re-use of work, the community platform provides club participants with the option to decide on what level they want to share their documents and projects (e.g. to all, to friends, only for me).

When first prototypes had been designed by the research team, several children in the different clubs in Germany took part in the evaluation of their functionalities. Their

[1] http://www.facebook.com
[2] http://www.meinvz.net

feedback again informed the platform design. In parallel, the prototype was always shown to the teacher, as well as to the parents in the club who showed interest in the evolving structure of the platform especially with regard to its difference to known, commercial tools.

Finally, the community platform was put online for participants in all computer clubs to use. This process was accompanied over the course of several club sessions by members of the research team observing how the new tool integrated into the structure of the club sessions, and whether details and features that had resulted from the design process stood the test of everyday club practice. The platform functioned well, with no identifiable issues, and participants could be seen to routinely check their profiles, write messages or upload pictures and projects in the weeks following its installation.

Findings II

Our case study of the design of a club community platform again reveals the way in which underlying values were translated into quite practical terms, and moreover terms which implicated, at least in respect of parents, children and teachers, the immediate experiences of participants. Here, *crosscultural understanding* and *respect* translated, for the researchers, to a fairly general concern for the fostering of communication. Participation in the platform enabled the exchange of perspectives and experiences, skills and ideas of young and adult people in geographically distant yet similar settings (Table 5.8). For the other participants, such concerns were not in any immediate way evident.

Thus, researchers tried to display a professional openness and flexibility with regard to the local implementation of their idea of a club community platform. Confident in their everyday contact with, and use of, modern ICT, they were primarily concerned with overseeing technical options and implications and with estimating the consequences of a poor design decision.

Teacher, children and parent club participants expressed different attitudes: their view on social media and its possible use in the club was determined by (i) care for, especially, the safety of participating children, (ii) individual experiences they had gathered as users of online community platforms and (iii) incomplete or absent information about the technical background. This mixture resulted in ingenuous, playful curiosity on the children's side. Several statements from children illustrate this:

> Boy 1: *"This is cool. See: it lets you write messages, too!"* (He types a message for his friend, sitting at a computer at the opposite side of the room. As soon as he has sent the message, he jumps up and runs over so he can see how his friend opens and reads his message.)
> Boy 2, smiling: *"I'll write you back."* (Opens a response message, starts typing, then sees that his friend is still watching him.) *"Hey, don't look!"*

Another evidence for this playful curiosity on the children's side can be seen in the fact

Direct Stakeholders	Indirect Stakeholders	Stakeholder Values
Researcher/Designer		• communication
Child		• playful curiosity • self-expression • display of skills
Parent	Parent	• data safety • protection of the children
Teacher		• data safety • protection of the children

Table 5.8.: Case study II: manifestation of values in the different stakeholder groups.

that the research team found children to be active on the platform even before its actual launch in the various computer clubs. Having been involved in the evaluation of platform features, it turned out that the children had memorized the platform web address (which at that time still was a rather complex work-in-progress address, where the platform was still under development) and their evaluation login and returned to the platform to "play with it some more" after club. On the side of the adult club participants – of migrant and non-migrant backgrounds alike – there was at first significant distrust and unease with entering into a discussion and even into a design activity.

> Mother 1 (migrant): *"But is that safe? Who can be a member?"*
> Mother 2 (migrant): *"I have heard so many dangerous things about Facebook and these kinds of platforms. That's not suitable for kids..."*
> Mother 3 (non-migrant): *"What would we need this for after all?"*

As the design process of the community platform moved ahead, and teacher and parents in the club understood how the platform was designed to be a closed online space only accessible to members of the computer club, unease became less evident. Here, a shift of parents from indirect to direct stakeholders could be seen and was key to this change. Once mothers in the clubs got accounts on the platform themselves and could directly interact with the technology to explore its design and functionalities, the mothers were appreciably less concerned.

> Mother (had googled the platform site and explores it while not being logged in): *"I can't do anything... There is nowhere to go..."*
> Tutor: *"You need to be logged in to see what's going on and use all the tools."*

Also, teachers involved in the club got an account and familiarized themselves with the administrative rights assigned to them as a supervising member of the club: they learned

how to create accounts for new club members and how to reset forgotten passwords. They also started to engage in the regular use of the platform together with the children who were club participants. Again, this indicates the progressive way in which values expressed at a fairly general level become translated through the lens of experience. Initial fears over safety and/or privacy largely went away with a developing familiarity. Participation in the platform became valued among the mothers and teachers involved in the club. They came to see its affordances, and to recognize that it was a closed and thus safe online space where online behavior and etiquette could be explored and trained.

Members of the research team accompanied this appropriation process. Whenever new functionalities, bugs or malfunctioning features (e.g. friends "disappearing" from children's friends lists after they had been added) caused questions, or other issues (e.g. lost or forgotten passwords, privacy issues, or the handling of personal information online) arose, this was talked through with members of the research team in the clubs' joint discussion rounds. That way, value tensions could be addressed and eased, e.g. when children wanted to reveal more personal information in their platform profiles than adults would consider appropriate. Special attention was paid to the handling of photographs of the children. *Cross-cultural understanding* was reached in discussions among children, parents, teacher and the researchers in the club that this was a sensitive issue, especially for the Muslim children in club A, whose parents did not want their children to be seen in any images. While surfing the platform, two Muslim children discussed the issue:

> Boy 1: *"See – I put my favorite animal as my profile picture. Can't have my own picture..."* (shows the image of a shark to the tutor). Tutor: *"Why is that?"*
> Boy 1: *"My parents won't let me."*
> Boy 2: *"Yeah – me neither."* (sighs, clicks around undecidedly, then suddenly appears to be excited about something) *"Look! This is really cool! Best soccer player EVER!"*
> In the following half-hour, the boys are seen to alter their profile picture repeatedly, making it either the logo of their favorite soccer team or player, or a favorite animal, a popular band or a singer.

Their mothers in the background, observing this, start a dialog with the teacher, prompting her to approve this strict perspective on the use of images: *"It is not safe"*, one mother would say, the other one adding: *"You never know, what happens once the pictures are out there."* Teacher: *"Yes. You cannot take them back."*

Once the children had settled to the use of alternate pictures of famous characters or things they liked instead of images of themselves, the strict attitude of the parents was no longer a topic for discussion in the club's sessions and the children adhered to the parental view. Soon the new tool became very popular especially among the children in the computer club. Frequently they would ask whether they could "do the platform" now, even before saying "hello" when entering the club (Figure 5.2). Field notes regularly show that the majority of the children in the club would devote the initial 15 minutes of

Figure 5.2.: Children exploring the community platform.

a club session to platform usage, before everyone would then get together for the joint project work.

5.5.3. Case study III: appropriation of pre-existing hardware

Case study setup III

The third case is concerned with the appropriation of pre-existing technology to meet an identified community need. Right from the start, the computer club had developed as a neighborhood oriented endeavor. Teachers, tutors, children and adult participants alike had perceived and used the club as a means to process neighborhood experiences in the form of creative, technology-related project work. These projects often had a strong link to school and neighborhood events, such as a "Day of Play", where all neighborhood inhabitants were invited to gather in the open spaces of their quarter to play parlor and sports games, and where the computer club participated with a self-made collection of children's games from countries around the world.

As a consequence, the members of the research team working in the club as tutors saw the need to support links in the wider community with mobile IT equipment. The idea developed among the researchers that the so-called "100-$-Laptop", the OLPC XO-1, might be a device that would suit the computer club structure and its out-reach character well. Designed along the lines of constructionist thinking (Papert, 1980), that one learns by doing, an emphasis has been put in the OLPC XO-1 design on software tools for exploration and expression. In a "zoominterface" called Sugar, programs appear as "activities" and fellow XO-users are organized according to their respective current XO-activities – a structure that is completely different from the standard desktop computer. Also, the OLPC is equipped with a hardware that invites outdoor usage even under extreme environmental conditions (energy-efficiency, integrated router that allows mobile ad hoc networking without additional hardware, shock-proof solid state drive, not more than two internal cables, rubber-membrane keyboard). Originally, the OLPC was designed

for usage by children in developing countries around the world, enabling them to "learn, share, create, and collaborate, [...] become connected to each other, to the world and to a brighter future" – thus creating "educational opportunities for the world's poorest children" (Child, 2013).

The research team members were well aware of the fact that they – and with them the computer clubs – were not located in a developing country. But still, the OLPC design was considered to suit the club structure well, in that it was a mobile device:

- For exploration and learning, possibly easing the acquiring of computer skills for beginners. The organization and display of fellow users according to their respective activities could offer additional orientation. Coming with a completely different interface than the common desktop-metaphor, use of the OLPC was expected to also broaden the understanding of computer technology, enabling its child and adult users to later switch naturally among operating systems.
- Whose software clearly subordinates to the users' respective aims and plans, in that it is displayed as "activities" in the Sugar interface of the OLPC laptop.
- That with its Sugar interface, it displays who else is engaged in what activity and, thus, supports flexibly gathering, working, or playing in the club.
- Enabling mobile on-site exploration of certain neighborhood aspects and activities. Thus, explorative club activities may happen with the computer – instead of later on being processed and handled after the fact by means of the computer.

Even if it was so different from other computer systems, the researchers still considered the OLPC to be suitable for acquiring computer skills, in that it would enable participants to deepen their confidence when approaching an unknown piece of technology. An order for ten OLPC laptops was placed as part of an omnibus order by a nonprofit association devoted to the promotion of the use of the OLPC. Also, members of the research team and the local nonprofit organization developed ideas for potential projects involving the OLPC in the computer club. One member of the local nonprofit organization had previously gathered practical experiences with projects involving the OLPC, so he was especially enthusiastic about the prospect of deepening this practical experience. This local enthusiasm was dampened however, by the long delivery process of the laptops, which took two years to be completed. By then, a major change of participants had taken place in the computer club as well as in the local nonprofit organization. Also, research had found some major shortcomings in the OLPC (e.g. Cotten et al., 2011; Warschauer and Ames, 2010; Warschauer et al., 2012) by then. But as new participants also liked the prospect of trying out this new device, the OLPCs were taken to the club nonetheless.

In an exploratory session in early 2013, club participants first investigated the functionalities of this unknown mobile tool, and then they jointly developed and put into practice a club project idea involving the new hardware: they decided to make use of the OLPC laptop to create little animated stories about themselves, their club and their

Direct Stakeholders	Indirect Stakeholders	Stakeholder Values
Researcher		• mobile collaboration • constructionist learning
Child	Child	• playful curiosity • smooth functioning
Parent		• learning • smooth functioning
Teacher		• learning • mobile collaboration

Table 5.9.: Case study III: manifestation of values in the different stakeholder groups

school which they then wanted to share with one of the newly founded computer clubs in Palestine.

Findings III

The introduction of the OLPC XO-1 laptop as additional hardware to support the club's outgoing character very soon confronted the members of the research team with the issue of conflicting values (Table 5.9). Researchers had learned about the OLPC's emphasis on collaboration and constructionist learning with its software and interface literally circling around the individual and its activities, while at the same time putting the activities of other users nearby on display. Researchers saw this as matching the club's underlying values of cross-cultural understanding and respect in that it fostered individual creativity and learning while at the same time inviting collaboration and learning about the activities of others.

Club participants in turn were seen to especially value the unobtrusive and smooth functioning of the device. The introductory club session, where participants were invited to explore the unknown device (Tutor: *"Take a look and explore! Find out what you can do with it!"*), was characterized by curiosity as participants tried out the OLPC's different functionalities (Figure 5.3). In doing so, children worked in teams and gathered at different spots in the computer room. There was considerable movement around as children saw that someone else in the room had discovered an OLPC feature that would possibly be of interest to them (usually, children would audibly signal their new, exciting findings: *"Come and see what I found!"*). Some also took the OLPC outside to different locations in the school building and tried out the photo and video tool. In doing so, they received and enjoyed a considerable amount of attention from other children in school, who expressed their desire to touch the unfamiliar piece of technology and use and explore this as well. *"Can I take it?"*, they would repeatedly ask, but children from

Figure 5.3.: Club participants discover the functionalities of the OLPC XO-1.

the computer club would refuse, proudly insisting that this tool could be used *"only if you are in computer club."* In the closing discussion round, all teams in the computer club excitedly shared their discoveries of OLPC features.

In subsequent club sessions, our study saw this initial enthusiasm lose ground. Children as direct stakeholders became progressively less enamored with the device as they discovered technical shortcomings. While they had been enthused by the prospect of being able to move freely to different locations, this enthusiasm was dampened when they experienced how the laptop was not able to process the images and video clips they had created along the way in their club project work in the same smooth manner they were used to from working at the stationary computers in the computer room, or other computer equipment at their homes. Several children expressed their wish to continue the work on their respective project *"with one of the real computers"*; the OLPC's outward appearance with its small keyboard and screen added to the children's unfamiliar feeling and added to their wish to return to working with the PCs in the computer room.

Furthermore, participants' initial enthusiasm about the networking features of the OLPC was reduced as soon as they learned that they would not be able to hook up to the school's own (locked) WLAN. Disruption of project work with the OLPCs was also caused by participants accidentally switching from the display of software "activities" to the mobile ad hoc network display of nearby fellow OLPC-users. On the part of the children, extensive explanations and tutorial guidance was needed in order to get along with the unknown interface of the OLPC – and it turned out that this conflicted with the attention and enthusiasm that the children were devoting to the creation of their respective project works.

Progress of the project work showed that in the eyes of most of the club participants the new mobile devices were not the sole tool of choice to complete their projects – due to shortcomings in processing power, or the unfamiliarity of the interface as well as the small size of the keyboard and screen. In consequence, many participants started out using

mobile technology but switched back to using the stationary computers to finalize their ideas. This use habit manifested itself also in subsequent project work, where children liked to use the OLPC for mobile recording or data collection purposes around school (and enjoyed the attention that the colorful little devices generated for them among the other children in school), as well as for early idea generation, but then continued their work at the stationary PCs in the computer room.

5.6. Discussion

Our study of the computer club is concerned with the question how values come to be deployed situationally, with regard to the socio-technical computer club design as well as the actual technology setup within. As we argued at the outset, value sensitive design is and was particularly germane to the aims of our computer clubs. Our study of three cases from the intercultural computer club, we argue, informs value sensitive design discourse on the *conceptual*, the *empirical* as well as the *technical* level which have been established in previous research (Friedman et al., 2002, 2006). Having said that, it was equally clear that some features of the discourse needed unpacking in the specific context we describe. We were interested in value sensitive design as a framework for understanding and organizing our experiences because it offers a clear commitment to building on expressed and explicit values while recognizing their fluid nature among different interest groups. Further, its methodological openness offered a flexibility that allowed for a range of methods and techniques to be applied to the research situation. This, we felt, was particularly appropriate both where children were involved and where we were routinely active in the computer clubs as participants ourselves. Lastly, the relatively long-term nature of the work meant that an iterative/negotiative approach was indicated. That said, we were conscious that a variety of challenges had to be met. Specifically, and as we have suggested, the conceptual focus on values required some careful analysis, since it became clear to us that Borning and colleagues were entirely correct in their assertion that values had to be construed as situational. The empirical focus required us to think carefully about how best to conduct research where we were active participants, reflecting carefully on what kinds of material might constitute 'evidence' for the way in which values become manifest. Lastly, the need to negotiate between design strategies where we were limited by a variety of considerations, and specifically where both hardware and software had at least some "off the shelf" elements, meant that we needed to clarify how the "technical level" of value sensitive design actually panned out in practice. Thus, we structure our discussion of findings, focusing on each party involved in turn: (i) researchers, (ii) practitioners and (iii) users/participants.

5.6.1. The researcher and designer perspective

At the *conceptual* level, a key finding from all three cases concerned communication practices. Beginning with the planning and setup of the computer club and continuing

with the cases of designing the new club community platform as well as the introduction of new mobile hardware to the club, communication and transparency proved to be crucial factors. They are key to a levelling of power among the different stakeholders lay in the need to ensure that common understanding is reached (e.g. when club participants were initially skeptical about the development of the community platform for the computer clubs because they did not understand its technical structure and closed nature). In a local setting, where social and educational backgrounds greatly diverge, and a common language is not always a given, the translation of *cross-cultural understanding* and *respect* as values from an overarching public discourse to a specific socio-technical initiative on the local level requires a detailed and attentive collaboration of all involved stakeholders.

Thus in the neighborhood, the researchers continually worked to balance and align the experience they had gathered in previous research with the structures and concerns of the local community and its members. Borning and his colleagues in (Borning et al., 2005) as well as (Borning and Muller, 2012) have previously made a claim for the situatedness of values, emphasizing that "questions of values seldom have single, definitive, "objective answers"", and suggest that researchers should consider committing themselves to a "practice of self-disclosure" (Borning and Muller, 2012, p. 1130) as is common in ethnographic research (Coffey, 1999; Dourish, 2006). Alsheikh et al. (2011) have shown how this researcher background has a practical effect with regard to choice of method and theory involved. Certainly, we cannot assume that all participants share the same values nor that, when they do, those values are expressed in the same way. Employing a value sensitive design perspective enables the researcher to disclose the various values at work (e.g. the privacy concerns on the side of the parents with regard to the design of the online platform, or the guided access to IT and related skills that the club opened up for local residents), so they can be taken up in the course of the research activity.

This entails implications for the *empirical* and the *technical* level at the same time: pursuing the challenge to design a sociotechnical initiative that to a large extent relies on matching existing technology with what looks like a given set of values, researchers need to maintain a constant close relation with the local people who are involved in or otherwise affected by the socio-technical initiative. Their view(s) on the explicit values promoted by researchers are predicated on a different spectrum of experiences, which in turn calls for constant close negotiation and balancing of the latter. This, of course, raises methodological issues in relation to how this can be done. Our choice of participatory action research as a means to do that, associated with a broadly ethnographic stance on the collection and interpretation of data, allows us to instantiate the way in which values are made manifest in and through the ordinary pragmatic, day-today, concerns of participants and our attempts to negotiate our way through them. With this, our work supports the argument of Iversen and Leong (2012), who have focused on the elicitation of values in a participatory design process (ibid.). Our study extends their emphasis on researcher values in a design process (ibid.) by including this constant close attention to local stakeholders affected by the socio-technical initiative and their practical concerns. In the computer club initiative, those views are exchanged and discussed in the research team's weekly meetings, where tutors from other clubs provide a fresh perspective. By

pursuing our participatory action research approach, our role as researchers is sedimented in relation to educating and being supportive to the community needs (Brydon-Miller, 1997; Racadio et al., 2014). Transformative change however, needs to develop from within the neighborhood community. Only together with the local users – with children, parents and teachers as direct and indirect stakeholders, can researchers and local practitioners translate values into a lively and engaged weekly club experience.

5.6.2. The practitioner perspective

This extension of value sensitive design perspective also broadens our understanding of the role of the practitioner. While researchers and designers are often, in previous works (e.g. Borning and Muller, 2012; Iversen and Leong, 2012; Iversen et al., 2010), assumed to have a dual role, the employment of a value sensitive design perspective requires a distinction here: its grounding on the local community or neighborhood level calls for the explicit inclusion of local practitioners and their stance towards the use and inclusion of one technology or another in the social structures of their professional social work within the boundaries of community and neighborhood structures. With regard to the *conceptual* level this shows a clear need for open communication structures, enabling the research perspective and the local view(s) to meet and somehow balance out. Our example of the initial planning of the intercultural computer club showed that this was an important first step, facilitating every subsequent action in the neighborhood.

The open, and relatively unstructured, nature of the communication process would serve the *empirical* and *technical* level in that it would facilitate an equal inclusion of local practitioners involved in social community matters (such as the neighborhood managers or school teachers involved in our computer club example), as well as design practitioners entrusted with the development of a new technology such as the club community platform. To our extended value sensitive design perspective, both are relevant. We are constantly weighing the value-driven design of new ICT alongside the costs and benefits of existing ICT and community acceptance, or otherwise, of both. Our study of value-driven activities on the local community level shows the need to simultaneously pay attention to the development or introduction of ICT and to the structuring of its social setting: the community platform needed a stable surrounding club structure – respectfully tending to the individuals in the club – to be first developed and then well received by participants, and the OLPC needed to be embedded in a matching club project structure in order to be smoothly adopted by club participants. This extends the work of Miller et al. (2007), who previously emphasized the importance of co-evolution of ICT and organizational policy in a working context to a local, intercultural community setting.

5.6.3. The user perspective: children, parents and teachers as direct and indirect stakeholders

The user position is potentially the most powerful one in the process – but our close reading of the three cases shows that it needs careful attention in order to 'unlock' this power and translate it to a lively local experience. Similar to experiences from participatory design studies (Iversen and Leong, 2012; Le Dantec et al., 2009), the children, parents and teachers here acted variously as direct and indirect stakeholders in our three cases, and displayed a rich set of ideas and views which contributed to the respective endeavor, often paired with very firm views on what was appropriate or wrong in a certain situation (e.g. with regard to the setup of the community platform) – but they frequently lacked the ability to fully express all this. This entails implications simultaneously affecting the empirical and the technical level. Researchers and practitioners face the need to:

- Ensure that with regard to the empirical level there is ample and continuous room for feedback not only on a newly designed piece of technology (like the club community platform), but also on pre-existing but newly introduced pieces of ICT (such as the OLPCs). Cotten et al. (2011) have described shortcomings of the OLPC in a large-scale user study at schools in the US with regard to technical infrastructure, suggesting that a stable social infrastructure where support and explanations with regard to the handling and maintenance of the hard- and software are given, would help to ease if not overcome the technical shortcomings and foster regular usage. Warschauer et al. (2012) as well emphasize a need for "solid curricular and pedagogical foundations", the inclusion of "requisite social and technical support" (ibid., p. 73). Our small-scale study of OLPC appropriation in a computer club setting, where children as users and direct stakeholders were not concerned with maintenance of the device, and technical support and explanations were given by the researchers as tutors at any given time needed, saw technical flaws continuing to intervene negatively in the process of mobile exploration and collaboration.

  Our study extends the recent work of Yoo et al., who focused on designer and stakeholder prompts as a means to engage stakeholders untrained in design and centering not only on appearance and functioning of a technology, but also on its social and valuerelated use context (Yoo et al., 2013, p. 419) to a local community setting. Our study strengthens, we argue, the claim recently made by Borning and Muller (2012), that value sensitive design should "consider adapting those methods that foreground the needs, designs, and analyses of the "users" in participatory design, such as co-design, participant-led story-telling, drama, photo-documentary and video-documentary" (ibid., p. 1132), by extending it to the process of matching an existing technology with a given set of values. Evidence for this in our study was in the case of the OLPC, where computer club participants finally engaged in the process of designing and determining the social setting for the OLPC project activity in the club (go out and explore with the OLPC but do the "real work" with the more powerful stationary PC in the computer room).

Like Pablo Freire's findings (1970) on the process of children's reading learning with words and images of their own everyday worlds in favelas of urban Latin America, the computer club initiative, too, relies on a strong link of learning and language. It does so by embedding technology learning with everyday neighborhood reality, so the participating children and adults "have words for what they learn". This was the case, when the newly developed community platform alluded to the school setting in its design, e.g. with a separate "blackboard" for each club and a pin board where memos could be left on virtual sticky notes for everyone on the platform to see. Here, especially the children could explore and appropriate the platform with words and concepts known to them from their everyday life context in school. Similarly, the OLPC was appropriated in a project activity outgoing to the neighborhood, when children created little animated stories about themselves. Socio-technical initiatives like the computer club in the focus of this study, need to develop and rely on social structures like the joint opening and closing discussion rounds, or the co-participation of children and parents, in order to make decision making processes visible to all involved parties and make the diverse young and adult voices in these processes be equally heard, as far as is possible. At the same time, these social structures ensure a stable link to the local everyday life context of the children and adults, thus securing that they would always "have words" for their learning experiences.

- Take care that on the technical level a given set of values inherent to a pre-existing piece of technology, as well as immanent to a design process, is clear and understood by all parties involved in the process of its introduction or development at all times. This is an entirely non-trivial matter, especially where children are concerned, or divergent social and educational backgrounds are involved. Again, dependable social structures like discussion rounds or the computer club's "treasure box of ideas" can provide some stability and help clarify steps and actions taken and develop decisions in a collaborative manner. With regard to the local community or neighborhood level, this may require special, regular attention as participant and user structures can change quickly, whereas on the other hand the introduction of a technology (such as the OLPC) may take an unexpectedly long time.

5.7. Conclusion

We set out, predicated on a long-term, principled, involvement with intercultural computer clubs in Germany to implement an explicit set of values concerning cross-cultural understanding and respect. With this, we were attempting to translate two values stemming from an overarching national public debate on migration and multiculturalism to the local neighborhood community level. Put simply, values in the abstract are only made visible in and through specific occurrences where preferences are made clear. When we examine those specific circumstances, it is evident that a more nuanced view of the "values" in question is necessary. At exactly the same time, we were concerned as researchers

to get a clearer understanding of the processes involved in implementing such policies and what the various challenges associated with such value-driven work might be.

In our study of three cases drawn from experiences in an intercultural computer club, we have highlighted the relevance of open communication structures among researchers and local practitioners, but also shown that they are not easily attained. Our results have shown the need for methodological support that spans a wide range of user experiences, social and cultural backgrounds, and of equal importance, doing so over extended periods of time.

As consensus has grown among system designers and researchers that values are needed as criteria for system design, this focus on a value-driven, socio-technical neighborhood initiative illustrates the need to shed light on the challenge of designing an initiative of this kind, not building all things "de novo" but also matching existing technology with a set of values that, on the face of it, are clear, but which turn out to be negotiable and instantiated in a variety of ways which depend on local conditions and experiences. Thus, we are extending a perspective that is well-known from a software engineering point of view (e.g. Szyperski, 2002) to a socio-technical community setting.

Our study of the three cases from a local intercultural computer club disclosed key factors inherent in the conceptual negotiation of values among researchers/designers and practitioners on the local (neighborhood) level. We extend previous works from (Borning and Muller, 2012) arguing for transparency in the research process and an openness to multiple "right" answers, by examining how in practice that takes place in a context where practitioners, designers, local professional interests, children and their parents are engaged in the long-term negotiation of these issues. We see open communication practices among all stakeholders involved to be central. Those practices allowed for the constant balancing of values and the flexible, constantly developing local community structure. Building up on the work of Alsheikh et al. (2011) and Friedman et al. (2008), we showed this to be especially relevant in a culturally diverse (neighborhood) setting, where not only language barriers, but also the wide spectrum of social and professional user backgrounds, can cause communication problems.

Furthermore, we demonstrate challenges inherent in the empirical process of determining the ideal socio-technical setup: our study showed a clear need for ongoing observation and equally regular reflection/discussion in order to identify the contextual ways in which values are made manifest, the issues and problems that result, and at the same time provide room for feedback, in order for the multiple "right" answers that there may be to evolve. These "right answers" may implicate cultural as much as technical matters. Expanding on the works of Iversen and Leong (2012) and Le Dantec et al. (2009) to the consideration of off-the-shelf technology, we have shown the need to employ feedback modes that allow for a variety of professional and non-professional stakeholder backgrounds, and for dependable social structures that can level out power differences among the stakeholders. Finally, our study highlights challenges entailed in the technical process of determining and setting up the technology that best matches the respective value(s) of the local initiative: here, our analysis sees users/participants in a powerful position, in the sense that

they personify the stated values of the intercultural club initiative – but are frequently unable to make use of this power and consequently unable to "unlock" their views with regard to a given piece of IT or its design without appropriate support. This supports findings of Yoo et al. (2013) and calls for methodological support that can span a wide range of user backgrounds.

5.8. Acknowledgments

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6. "All of a Sudden We Had this Dialogue. . .": Intercultural Computer Clubs' Contribution to Sustainable Integration

6.1. Abstract

A sustainable integration of migrants is an important societal task, touching numerous parts of everyday life. Developed as a socio-technical concept, intercultural computer clubs following the come_IN approach are apt to provide a major contribution here. The aim is twofold: via collaboration in computer-based project work in the clubs, its participants a) establish and strengthen relationships in the intercultural neighborhood they now live in, and b) acquire computer skills that may broaden and ease their access to the job market as well as help them to keep up a remote relationship with their respective home countries. A qualitative evaluation study reveals the chances and limitations of this concept.

6.2. Introduction

Migration is one of the major issues of societies around the world in our present time – the more urgent, the more increasing the number of migrants seeking first for access and then for participation in society. Understandings of what it takes for integration not only to happen but to last are numerous – as are the attempts to put these into practice on the micro level of everyday life.

It is this combined look at integration discourse on the macro level and its specification in everyday practice that provides us with an understanding why it might be useful, even necessary, not only to talk about integration but to approach it as an integral part of a sustainable development of the world we live in. We analyze and discuss the chances and limitations that the intercultural computer clubs come_IN contribute to that matter. Situated in primary schools, the intercultural computer clubs come_IN offer a place for shared (computer-)practice of children and adults, thus bringing together people with different migration backgrounds in culturally diverse neighborhoods. Once a week they voluntarily gather in the computer club, work on joint projects or realize their individual

ideas at the computer, study and play. In this shared practice the club participants may acquire computer skills that may broaden and ease their access to the job market as well as help them to keep up a remote relationship with their respective home countries. Computer-based project work in come_IN does also serve to establish and strengthen relationships in the intercultural neighborhood.

Our evaluation study comes from a specific German context, but we think that the detailed analysis of the effects of the socio-technical structure of come_IN contributes to a deeper and more general understanding of technology and its impact in the interactional context of a socially and culturally diverse neighborhood.

The analysis and argument of the paper combines a societal macro level problem and the micro level analysis of a local solution. On a macro level, we approach integration as an integral part of a sustainable development of the world we live in. This provides us with the structural elements of our evaluation study of come_IN. We complete the macro level perspective by providing an overview on the debate on and development of integration processes in Germany.

On a micro level, the design of the social concept of the intercultural computer clubs come_IN is then described, including a brief overview on the various clubs. For the micro level evaluation, how this socio-technical concept can contribute to a sustainable integration of migrants, we conducted a series of semi-structured interviews with club participants, thereby combining perspectives of *old-timers* with long experience as club participants and spontaneous reflections of *newcomers* to allow for a substantiated understanding of the subject matter.

Each of the results from this micro level analysis is discussed in regard to its contribution to the characteristics of a sustainable integration as we have previously distilled them from the current macro level debate on integration, thus revealing chances and limitations of the come_IN concept for a sustainable integration of migrants.

6.3. Related Works

The concept of the intercultural computer clubs come_IN has been developed within the tradition of computer clubhouses in the US and around the world, where principles of situated, collaborative learning and constructionist thinking have opened up many chances and new opportunities for disadvantaged inner city youth since the first club was established in Boston in 1993 – their structure and success is well documented in research (e.g. Resnick et al., 1998; Michalchik et al., 2008; Kafai et al., 2009). With the establishment of intercultural computer clubs come_IN in Germany the US computer clubhouse concept has been developed further and applied to issues of integration of migrant communities.

The focus on Germany, where the come_IN computer clubs are located, shows the country's debate on and the need for initiatives for the integration of migrant communities

with society's mainstream being mainly discussed on two levels: a) along the lines of discourse on the "digital divide", the unequal access of migrant communities and mainstream society to computer infrastructure, and b) related to the discussion on "Parallelgesellschaften", "parallel societies", where migrant communities live with few or no contact to society's majority – neighborhoods that some see as a proof for decades of failed societal integration policy, and that others approve to some extent as a place to preserve cultural tradition and language, thus serving as a bridge between cultures.

Migration to Germany has developed in three parallel movements since 1945, with 1) Germans and people of German ancestry migrating in from the East, 2) "guest worker" and their families moving to Germany from Italy, Spain and Greece, Turkey, Morocco, Portugal, Tunisia and Yugoslavia in the 1960 and early 1970s, and 3) refugees, seeking for asylum. Looking at the years from 1950 until today, migration movement to Germany from the East had its height around 1990 with approximately 400,000 resettlers annually; until now, this migration movement has decreased to significantly less than 100,000 people per year (Bundesministerium des Inneren, 2009). According to most recent statistics (of: 31.12.2008) (Bundesamt für Migration und Flüchtlinge, 2008), people from Turkey form the largest of the immigrant communities in Germany (25.1%), followed by Italians (7.8%), people from Poland (5.6%), former Serbia and Montenegro (5.2%), Greece (4.3%), and Croatia (3.3%). 17.2% of the immigrants were from "EU-countries, except Italy, Greece and Poland"; 31.3% were from "other countries" around the world. Since these statistics rely on nationality they do not provide the full picture but give a brief overview on the dimensions of immigration from the various countries: Immigrant family members who themselves have been born in Germany, or who have attained German citizenship, do not appear in these statistics. So, statistics show a total of 8.8% of the population in Germany with a foreign passport but the share of people with a migration background is significantly higher. 22,085 people seek for asylum in Germany in 2008 (Bundesamt für Migration und Flüchtlinge, 2009), the majority of these came from Iraq (6,836), Turkey (1,408) and Vietnam (1,042).

It was only in 2004 that those three separate immigration movements to Germany merged into one public discourse on migration and its societal consequences, when the German Bundestag and Bundesrat agreed on new immigration laws, acknowledging on the highest political level that Germany is an immigration country and sees itself as such. Consequently, the German discourse on integration focuses on a) its structural dimension that is concerned with equal access to all parts of societal life, such as justice, governmental institutions, education, labor, standard of living, social security, and b) on its cultural dimension, dealing with a common basis for living that is based on common language, core values, common rules and mutual respect for and knowledge of social and cultural differences.

In the context of our study, this detailed look at migration statistics and development may seem over-complex at first sight, but it's not: It well illustrates the argument for a sustainable approach to integration. With integration, the above sketched statistics exemplarily show, societies will never be finished and done – it's an ongoing process, where

migrants, foreigners, resettlers, refugees and society's mainstream constantly negotiate terms and conditions of their conjoint living. The development of the handling of matters of migration as well as the accompanying discourse on and strive for the integration of the increasingly intercultural German society shows: Obviously, integration is about negotiating and agreeing on the conditions of common (public) life in a culturally diverse society.

A fact, that can also be concluded from the literal meaning of the Latin word *integrare* – "creating a unified whole". So, what does it take to achieve this creation of a "unified whole"? Integration, as it is discussed in science, politics and common public discourse, has a structural dimension that is concerned with equal access to all parts of societal life, such as justice, governmental institutions, education, labor, standard of living, social security. Secondly, it has a cultural dimension, dealing with a common basis for living that is based on common language, core values, common rules and mutual respect for and knowledge of social and cultural differences. Scientific and political integration discourse defines the immigration into a different country as the starting point of an integration process (e.g. Berry, 1984, 1992), followed by different specifications of adaptation: integration, accommodation, separation, and marginalization. The attitude towards the own identity as well as the intensity of one's relation to other groups are seen as important factors for the progress of integration processes. There is a large amount of literature on integration policy, drawing from political sciences, journalism and communications sciences, education and social studies. Typical studies in this area however, focus on a single type of societal actors or organizations (e.g. on the role of the media production (Müller, 2009) and consumption (Weber-Menges, 2005), or on teaching and education (Woellert et al., 2009). With regard to technology and technological interventions and its impact on integration processes the perspectives and interactions of different societal actors are rarely brought together into a single context – only just recently did researchers gather to bring the different perspective together: under the headword of sustainable diversity (Janssens et al., 2010).

6.4. A Sustainable Approach to Integration

Two questions have to be answered if one strives to evaluate matters of sustainable integration processes: a) what is sustainable?, and b) how and under what circumstances does integration take place in an intercultural society?

As a starting point for our enquiry of sustainability's characteristic elements we adopt the UN definition (Nations, 1987) stating that *"sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs"*. So what are these needs? Environmental aspects first come to mind, and this is what a large share of the discourse focuses on, e.g. discussing issues of energy consumption, waste and pollution (e.g. Aoki et al., 2009; Odom et al., 2009). Here, sustainability is about issues of material: It is concerned with energy efficiency,

recycling, and the replacement of polluting substances with those that are not harmful to the environment.

"Technology continues to facilitate the way humans shape the world", Mann and others open up their fundamental argument for an integration of education for sustainability into computing education (Mann et al., 2008). Wakkary and Tannenbaum identify aspects of sustainability in an ethnographic study of the creative, exploitive and thus sustainable interaction of families with design artifacts (Wakkary and Tanenbaum, 2009). Their work may be seen as exemplary for research that focuses on the actions of end-users – in contrast e.g. to Eli Blevis, who explores environmental impacts of design enterprises of professional designers (Blevis, 2007). Here, sustainability is about the individual's participation.

This social aspect has been taken one step further by various researchers (e.g. Huang et al., 2009; Nathan et al., 2008), also lifting it up from an individual to the community level, exploring how technology and its use is apt to trigger and support enduring community structures (e.g. Foth and Hearn, 2007; Satchell et al., 2008; Foth et al., 2006).

Returning to the starting question of our enquiry on sustainability, we can sum up the answers on the question on needs of present and future generations as follows: Regardless if we talk about 1) environmental, 2) individual, 3) community issues, or any combination of those, the crucial factor is time. Sustainability, so it seems, is about acknowledging that present doing or neglect does affect the future.

Applying this insight to the discourse on integration is helpful, because it leads to one important acknowledgement: Integration is an ongoing process – to be successful it has to be wanted and constantly worked on. Here, a useful connecting point can be defined, tying together the discourses on sustainability and on integration – which up to this point have been led in parallel, and understanding integration as a crucial dimension for a sustainable development of society.

Embedded in a socio-technical concept like come_IN computer technology is apt to touch upon both, the structural and the cultural dimension of integration. It can support a) structural integration by broadening access to information on and participation in several parts of public life – among them most prominently the job market, and b) cultural integration by providing immigrant and mainstream societal groups a tool to create and share mutual knowledge, compromise and negotiate differences, at the same time helping immigrants to keep up a remote relationship with their respective home countries.

Accordingly, we structure our analysis of the intercultural computer club's contribution to sustainable integration processes along the lines of these two levels, focusing on a) questions of access, and b) matters of community, culture and values.

6.5. Intercultural Computer Clubs

Situated in German primary schools, the intercultural computer clubs come_IN offer a place for shared practice of children and adults. In culturally diverse neighborhoods this brings together people of different migration background: Once a week they voluntarily gather in the club, work on joint projects or realize individual ideas at the computer, study and play. Via computer-based project work the club members can thus establish new social contacts, learn about the ideas of children and adults respectively – within their own and from different cultures. With this they can actively develop a new understanding of the neighborhood and their own share in it – an understanding that may be seen as a crucial step towards integration.

Several larger computer-based projects as well as numerous individual ones are part of the history of the first come_IN computer club that was opened in the Nordstadt of Bonn in March 2004 after two years of conceptual and preparatory work in the neighborhood. The multi-ethnic neighborhood has a large impact on the topics of projects and activities that children and parents choose in their weekly club-meetings (Stevens et al., 2005; Veith et al., 2007, 2009). Guided by school teachers and students from the come_IN-team who work as tutors in the club, small magazines about the neighborhood have been created; shared experiences like a two-day trip to Berlin or a soccer match with a neighboring Turkish soccer club resulted in photo- and video-projects, or have been processed by means of MIT's visual programming language Scratch (Maloney et al., 2004; Resnick and Silverman, 2005).

Basic rule for the computer clubs' weekly two-hour meetings is that every child should participate together with a parent. This rule was changed after a while – children, who could not participate together with a parent (because parents had to work during club time), were encouraged to join come_IN together with another adult family member or friend.

The transferability of the come_IN concept was tested with the establishment of a second come_IN computer club in a culturally diverse neighborhood in Siegen – about 100 km east of Bonn – in 2006. There, the experiences from Bonn have been used to refine a) social and b) technical aspects of the concept by a) establishing an opening and a final short discussion round, where all club members gather and talk about their current and prospective activities, and b) allow a more flexible way of playing and working in the club by retrofitting its equipment of stationary PCs with mobile laptops, and at the same time structuring the clubs file repository with personalized logins.

Four new clubs have been founded in summer 2009: a) a school complex in Bonn-Tannenbusch with primary school, secondary modern school and grammar school on one site brings together children, teenager and their respective parents in two clubs; b) a neighborhood initiative in the Nordstadt of Dortmund runs a club in a primary school; c) senior citizens in Kreuztal adapted the come_IN concept for their idea of a computer-project with teenagers in a youth center.

The accompanying come_IN project is guided by principles of participatory action research (McTaggart and Kemmis, 1988), gathering information on collaboration and interaction, appropriation to media and computer technology, learning and social integration from weekly field notes, narrative interviews, from group discussions, audio and video material. Complement to this qualitative social research is the active or observing participation in the clubs.

6.6. Evaluation Method

The claim to be able to control all variables that come into play, when a computer club come_IN is established and run in an intercultural neighborhood, would definitely be a presumptuous statement. Every neighborhood has a unique structure. Its inhabitants who participate in the club are of different age, cultural and social backgrounds, and bring along different IT knowledge and experience.

We do make allowance for this diversity in our evaluation study by relying on a dialogue-based method (Guba and Lincoln, 1981; Flick, 2006; Beywl, 2006), combining the perspectives of all involved parties – adult and children participants as well as tutors and teachers. We conducted our series of 20 semi-structured interviews over the course of eight months.

The fact that the come_IN idea has spread and started to grow into a network with several new clubs opening up just recently in summer 2009 puts us in a position where we can combine reflected perspectives of *old-timers* who have long experience of several years as come_IN club participants with spontaneous impressions and first thoughts of *new-comers* during their first club sessions, thus adding more weight to our evaluation of each of the characteristic elements of come_IN and its contribution to a sustainable integration process (Table 6.1).

Among *old-timer* and *new-comer* interviewees we have equal numbers of children and adults with and without a migration background. Two *old-timer* adults have a Turkish migration background, two are German; among the *new-comer* adult interviewees one is of Turkish, one of Indian migration background, and two are German. Of the *old-timers* children interviewees, one is Turkish, and one is German; the same distribution goes for the *new-comer* children.

To provide an understanding of the role of children, adults, teachers and tutors in come_IN, we distilled their activities from a sample of weekly field notes that are regularly being taken by tutors from the come_IN team during club sessions.

- **Children:** play, explore, try out, draw and paint, write, take pictures, search the internet
- **Adults:** watch/accompany/help the children, write, take pictures, learn image and film editing, search the internet

	Old-timer	Newcomer
Children	2	2
Adults	4	4
Teachers	2	2
Tutors	3	1

Table 6.1.: Interviewees and their roles in the clubs.

- **Teachers:** provide help for children and adults when needed, offer guidance for the development of new ideas
- **Tutors:** provide technical help for children, adults and teachers when needed, offer guidance for the development of new ideas when needed

Qualitative interviews with *old-timers* were taken outside club sessions and lasted from 30 to 120 minutes; first impressions of *newcomers* were gathered situated in the club sessions and lasted around 15 minutes.

The questions for the interviews have been derived from our concept of sustainable integration. We aimed at a) the socio-structural level, asking for the motivation to participate, duration of participation in the club, previous IT knowledge and experience, learning experiences in the club, and b) the cultural level, asking for cultural/migration backgrounds, the community experience, friendships, and favorite projects.

After all data collection was completed, we transcribed and coded the interviews. In coding we were guided by the two dimensions of integration – the socio-structural and cultural level. Using these we narrowed our focus in the evaluation study following principles of (Lofland and Lofland, 1995) and (Strauss and Corbin, 2004), and finally mapping these findings on our previously defined understanding of a sustainable integration.

6.7. Interview Results

Responses that children and adult *old-timers* as well as *newcomers* gave when we asked them about their motivations to participate in come_IN first highlight the computer club's contribution to socio-structural integration (Table 6.2). The club is seen as a place promising room for the individual appropriation of computer skills and exploration of computer technology, as well as providing guidance for a well-balanced usage and the handling of its accompanying potential dangers.

Evenly important appears to be the cultural level with community and neighborhood

socio-structural learning	**cultural learning**	**quote**
access to technology		*"At home that is a man's thing."*
(alternative) access to school		*"I didn't want to go there at first, because I thought it would be all school (. . .) again. But when I did go (. . .) it was fun."*
exploration		*"Naturally, when you discover something new, that's (. . .) cool!"*
	generational differences	*". . . I could see what he was doing, get an idea of what he's interested in. . . . "*
	neighborhood perspectives	*"All of a sudden, we had this dialogue. . . "*
	negotiation of appropriate technology use	*". . . he shouldn't be playing a cruel game like this, should he?"*
	social learning (listening, getting along with different opinions, sharing competence, providing help)	*". . . It's the social, that's important – that they learn to get along, to help each other, all that!"*
technology appropriation		*"Today I would sometimes rather NOT use the computer in certain situations (. . .) The computer and I – we're getting used to each other. . . "*

Table 6.2.: Overview on central interview results.

experiences and individual friendships. The interviewees name this to be a constantly underlying factor of all club activity. With regard to themselves they also describe this to be a motivating element for their participation.

Central element that is encompassing both, the socio-structural as well as the cultural level, is learning (Table 6.2). We focused our analysis along the lines of these elements that we gathered from the coding of the interviewee's responses. In the presentation of these results, we follow the two dimensions of integration – the socio-structural and the cultural level.

6.8. Analysis I: The Socio-Structural Level

On the socio-structural level, learning in the computer club appears to have two dimensions: 1) it is the process of mastering a tool that has become central in everyday life, education and work; 2) it is individual and playful exploration of possibilities.

"Ideally, I'd say it's a functioning tool, enabling things which otherwise would not be possible", a parent describes how the computer amplifies options. To a 9-year-old boy in the club in the Nordstadt of Bonn, technologically amplified options mean amplified fun: *"Naturally, when you discover something new, that's really cool!"*

Observing this learning process over time, it appears that a crucial element is the insight that not all that is possible and accessible has to be used and accessed after all. *"Today I would sometimes rather NOT use the computer in certain situations but instead make a phone call or the likes. The computer and I – we're getting used to each other..."* says a parent, who recalls how in the beginning he was eager to involve the computer in multiple of his free time activities in and outside the club. His statement encompasses the whole range of attraction and fascination on the one hand side and awareness of its powers on the other hand, that computers exert on children and parents.

Keeping this double meaning in balance has to be constantly worked on: Since come_IN is no computer course with lessons where an expert teaches just handling of computer technology telling children and adults right from wrong doing, appropriation of computer technology in come_IN results from constant negotiation among its young and adult participants. How much playing time is appropriate? What about computer games that involve some kind of violence? Do I damage the program or the computer if I make a mistake? How can I know I'm safe while surfing on the internet? What is main storage – and why does a computer need it? Teacher and tutors provide guidance to answers and solutions here – but it is an important aspect of come_IN that children and adult participants access and explore these themselves in the end. So here, learning is about empowerment too – and interviewees describe this as something that is hard work and great pleasure at the same time. *"I missed a certain consequence at times, which does not mean that this would have been a good thing to have at all times – but it would have been easier if there was someone who got up and said: 'Now we're doing this, and by*

Figure 6.1.: Computer club participants in Dortmund keep a "treasure box of ideas".

then we have to get that done, and then we check what's wrong, and I will get that fixed for you in the end'. [...] We did not have that in the computer club – and that's a good and sensible experience too", a father from the first computer club in Bonn recalls in the interview.

A tutor describes how this freedom to access and explore at first didn't play out for children and adults equally well: *"In the beginning it was very difficult to get the childrens' voices equally heard. Childrens' relation to talking is different – they have not yet fully developed an idea of its significance. I recall one boy in the club once complaining: 'Oh, this is a babble club!', when it took us a quarter of an hour to decide what we wanted to do in the club session one time. To adults, discussions like this are relatively normal – to children they're not."* Here it becomes apparent that come_IN is not only about providing access to computer technology – it is about access to and appropriation of decision making processes, too.

To get children involved and give them a voice in decision processes, a child and an adult per session now team up to moderate the computer club's opening and closing discussion round. And in order to make ideas accessible for later times, the computer club in Dortmund keeps a "treasure box of ideas" (Figure 6.1), a wooden box where children and adults write their project plans and ideas for activities on colored paper cards – this too has already proven to be apt to get children more involved in the club's opening and final discussion rounds.

There is a spatial dimension to socio-structural learning processes as well: By giving room to the computer club's activities, school opens up to children, adults and the neighborhood in new ways. *"That was exciting – to get to know school from a different perspective due to the computer club"*, a woman from the club in Siegen says. Children know the school from lessons in the mornings – at club time in the afternoon they can "take possession" of school more freely. A discovery that is judged upon as being able to foster learning: *"I didn't want to go there at first, because I thought it would be all school*

Figure 6.2.: Learning in the computer club is apt to bridge gender differences.

and learning again. But when I did go after all it was fun, because it was with other kids that I knew from school, and it was about exploring places, too – one time we even went to Berlin!", a Turkish boy says. In retrospect he judges: *"It was good to go there – it definitely improved my German speaking and writing."*

Also, a link to gender issues can be drawn from interviewee's responses on issues of learning in come_IN. As the computer club in Dortmund decided to take a very palpable approach to the computer, exploring its constituent parts with screwdriver, pliers and soldering iron as one of its first activities, it's the women in the club who show greatest interest (Figure 6.2). One of them explains, why: *"At home that is a man's thing."* Here, learning appears to be a question of access, too.

When asked about their motivation to participate in the computer club, especially the adult migrant interviewees voiced that they see computer literacy as an important prerequisite for participation in numerous parts of everyday life. They appreciated the computer club as a space where these skills could be improved – for themselves, but even more so for their children. *"I learned to write with the computer, search for things on the internet – do the easy things. But for my boys all this was even more important to learn"*, a Turkish mother of two sons describes. And a Turkish father adds to this: *"My daughter wants to become an engineer – of course that's not due to computer club alone, but it certainly had its share in awakening her interest in technology."*

6.8.1. Sustainable socio-structural integration

The socio-structural strength of the come_IN concept, it appears, lies in its openness: In a neighborhood where people of very diverse backgrounds, regarding their origin, culture, IT knowledge and age, come together, there appears to be a need for initiatives that are apt to bridge all these differences, and also overcome difficulties with regard to access. The computer club is seen as a place to acquire computer and information literacy, at the same time improving language skills and also accessing school from a different

perspective. This fostering of individual as well as collaborative learning processes may be seen as a very active step towards sustainably integrating this diverse neighborhood into a diverse community.

6.9. Analysis II: The Cultural Level

Culture and migration background is as a matter of course the underlying layer of all computer club activity. This does not mean that it is topic all the time. *"It's about bringing people together – even if they're not doing the same thing. They can work on the same project and still do something different – and have their own individual benefit from that. This is something that I've perceived as very positive"*, a parent recalls. From the very start he has participated in the first computer club in the Nordstadt of Bonn and seen how it strived for an identity that is something other than lessons and school – but still about learning.

A teacher points out how the social, cultural part in learning is most central: *"Of course you can always learn something about technology and computers in the club – but to me this is not the most important thing. It's the social, that's important – that they learn to get along, to help each other, all that!"* As a teacher she is always very focused on the children in the club, challenging them to get involved and develop ideas and to voice them, too.

Children seem to add a competitive part to joint work in the club (Figure 6.3). To them, it also appears to be a chance to compare their own abilities and learning progress to others in the club – just like the boy from the club in Bonn Nordstadt, explaining a quiz-game he has created in Scratch: *"How I made this work is with different levels, you know – to do this is not all too easy!"* Over months he could be observed being deeply involved in creating several little stories and games in Scratch, thus developing an expertise in the use of the program. To him this was a very unique and personal experience – and he got angry, if someone interfered in that, be it as a tutor to help with little hints and advice, or as a parent or teacher telling him to interrupt his work in order to take part in some kind of joint club activity. *"This, I don't like: If I'm working on my own project, and then someone says: 'Now, we're doing something DIFFERENT'."* Later on, the boy was well aware of his expertise also with regard to the other children in the club. He generously gave advice to others at times, obviously enjoying himself explaining things – and he was eager that no one would just copy figures and programs he had created without asking permission for that. So, learning in the computer club is not only about developing a certain expertise – it is also about balancing one's individual interests with the interests of others or with common interests that have been conjointly decided upon.

The boy, as well as another girl in the club in Bonn, also explains how he likes to play browser-games on the Internet and compare high scores with other kids in the club. Here, an immediate relation of technology use and technology creation becomes apparent: Proudly, the 9-year old describes how he searches for browser games on the

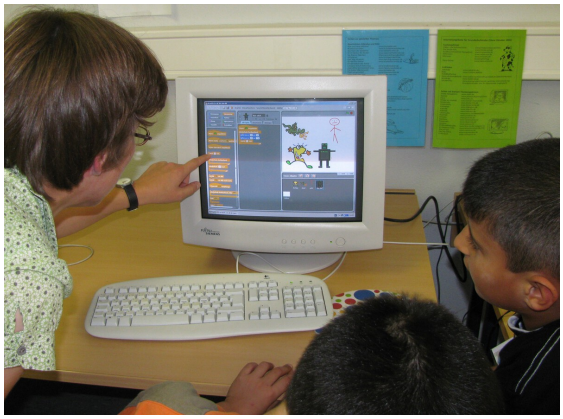

Figure 6.3.: Children also compare their own abilities and learning progress to others in the club.

internet, which ones he likes and dislikes – and when later on showing his own little game creations in Scratch, he frequently refers back to his online game experiences (*"Like that game with the airships from the internet that I talked to you about earlier, remember?..."*).

To parents the children's playful and explorative energy at the computer is sometimes difficult to handle – even more so if they themselves have not (yet) acquired much IT knowledge. At times they see the computer club as an opportunity to hand over responsibility. *"You tell him – he shouldn't be playing a cruel game like this, should he?"*, a Turkish mother reproachfully announces one time during club session in Siegen after to no avail trying to prevent her 8-year old son from playing a browser game that she considered to be too violent. Being interviewed she explains how it is an important motivation for her to participate in come_IN that she seeks for guidance in the just use of computer technology – for herself as well as for her son, for whom she feels not technologically skilled enough to provide guidance on her own.

Here again, the social and thus cultural aspect of learning stands out: When starting out with their first little Scratch projects in the next session, one child began painting a rather violent story about a horse that was almost eaten by a lion, but couldn't finish the project in the club session. When showing the first stages of his project in the final discussion round another boy said that he thought this to be too cruel: *"Man, can't you make a happy end?"* A mother in the round agreed, and said that she would join in the activity in the next club session to develop this happy ending in Scratch, which she herself had not used before either.

So here, a double learning process becomes apparent: It is about the appropriation of software as well as about the joint development of an agreement on what's appropriate handling of game playing and its aspects of violence.

A teacher describes, how joint work and learning in the computer club may have a positive effect on the relations of kids and parents, because with regard to computer work it puts

them in a similar position: *"Here it becomes obvious, that also parents can be learners."* Project work in come_IN is apt to bridge age differences. It allows parents to share experiences with their children, to access "their" world on a different, more equal level. *"Turkish parents work too much – we always work, we have to work to make a living. And then there is too little time for our kids"*, a Turkish father values the time he could spend with his son in the computer club. *"Little enough time that was way too often, due to my work – but never mind: I could see what he was doing, get an idea of what he's interested in. If you don't do this – be it in the computer club or elsewhere – one day, you may not know who your kids are."* A German father recalls how it was this bridging element that made him want to participate: *"School is an important factor in everyday life – but I didn't want this hard cut: School here – home there and nothing in between."*

Intergenerational learning processes can also be observed with regard to the neighborhood and its culturally diverse inhabitants. Here, adults and kids find themselves in the same learning position, when they explore their neighborhood and their respective cultures as part of several projects in the computer club: *"We went out into the neighborhood to explore places, and then we came back to the computer to put down what we saw with our own pictures and writing. This was fun"*, a girl remembers her first project work in the club.

This is where culture explicitly becomes a topic for the club. The idea to the "neighborhood stories" project of the computer club in the Nordstadt of Bonn roots in the observation that the club members' joint exploration of places in the neighborhood, followed by the processing of these experiences by means of the computer in the club, is apt to mobilize learning capacities that otherwise remained frequently unused. *"For me, there was an educational aspect to it, to improve especially the migrant children's reading and writing skills [...] When they came to the club they wrote their little texts, or maybe only underlines to pictures they had taken."*, a teacher from the club recalls in the interview.

In teams, children and parents decided on places and topics they wanted to explore: places of like and of dislike, special people, or the histories of their houses. They captured their impressions in photographs and texts that were then assembled to little brochures. And in the end, children and adults in the computer club did not keep these opinions and perspectives to themselves but proudly introduced them into the neighborhood by selling their "neighborhood-stories" for a little money during school events or in public places like the library.

A father as well as a teacher describes how this collaborative processing of neighborhood-experiences by means of the computer puts club members of different age and culture in an equal position as learners: *"All of a sudden we had this dialog [...]"*. Again, a double learning process becomes visible: It involves the discovery of different perspectives on common things, places, customs and people as well as the mastery of language to express this and computer technology to process this in writing and pictures.

This also counts for the newly founded computer clubs in Bonn-Tannenbusch – even

though there, the cultural aspect was decidedly pushed into the background during the planning of first club activities. *"Cultural diversity is a very dominant topic in this neighborhood – so much, that the kids are fed up with it"*, a teacher says. High unemployment rates cause social tensions in Tannenbusch, the crime rate is high and the neighborhood's reputation across the rest of the city of Bonn is bad. Accordingly, these factors were dominant in the computer club's planning and preparation phase: *"I hope that people in Tannenbusch take this initiative to realize that there also is something positive about their neighborhood – that it is not only the bad headlines in the newspaper, but also some good aspects that they can take up and strengthen"*, a tutor says. Here, learning in the club may again be about different perspectives on common things, places, customs and people – but here the social, economic factors are prevalent, and culture and migration backgrounds serve as an underlying, matter of course factor.

6.9.1. Sustainable cultural integration

Providing a space for joint exploration of perspectives, it appears, is what constitutes the cultural strength of the come_IN concept. The social context for the use and appropriation of computer technology is apt to foster social learning processes, giving each of the club participants the chance to have its opinion heard and valued, listen to others, help and being helped. For a sustainable cultural integration these abilities are crucial prerequisites.

6.10. Limitations

Openness, which appears to be the key strength of the concept, may be seen as its weakness at the same time: An initiative as openly structured as come_IN requires its participants to be attentive at all times, e.g. to ensure that voices and opinions equally get heard, and not one party is too dominant. Also, the concept behind this open structure is not self-evident at all times: Intercultural computer clubs come_IN are not designed to be a computer course with lessons where an expert teaches right from wrong doing – in a school setting, and within a society where much emphasis is currently put on education achievement, this requires explanation on the side of the tutors and may even discourage some people to participate. It requires teachers to step back from their traditional role a bit, and it requires children and adults to step back from the expectation to "be entertained" or to "be educated". They will be both – but there is an act of empowerment involved in this, and the benefit from that is not visible at first sight to everyone.

Finally, the open structure of the concept reaches its limitations in people's interest: Participation in come_IN is not mandatory – it has to be wanted. Accordingly, the club initiators do not know who they do not reach and why. The computer club in Bonn Nordstadt could see its numbers of adult participants decrease before the summer holi-

days of school – it responded to this by developing a questionnaire, aiming at the parents interests and inviting them to participate. Here again, the sustainability perspective proves to be helpful: It provides an understanding that it is necessary to be in a process of constant negotiation with the neighborhood participants in order to best meet their needs. It lies in the nature of the concept that it does not imply guaranteed success.

6.11. Conclusion

Our micro-level analysis of come_IN illustrates: Embedded in the socio-technical concept come_IN computer technology is apt to sustainably foster both, the structural and the cultural dimension of integration. It is apt to support a) structural integration by providing access to information on and participation in numerous parts of public life, and b) cultural integration by providing migrant and mainstream communities a tool to create and share mutual knowledge, exchange and discuss opinions, and learn about different perspectives on common things, when collaboratively realizing their project work in the club. What's sustainable about this? Most of all it is an openness which puts people of very diverse backgrounds, regarding their origin, culture, IT knowledge and age, in an equal position as learners.

Why does this perspective matter? It provides a needed contribution to the debate on integration which up to this point has mostly been focusing on single societal actors (e.g. Müller, 2009; Weber-Menges, 2005; Woellert et al., 2009), by simultaneously a) attempting to even unequal access of migrant communities and mainstream society to computer infrastructure, and b) providing a social structure that is apt to ease and sustain contacts across cultures and generations. The sustainability perspective on the computer club project provides another important insight: It shows the relevance of the attempt to achieve a) and b) not by means of imposing the computer club initiative from the outside, but by choosing a bottom-up approach, involving the respective local neighborhood communities in its development. Thus, the come_IN initiative is accounting for local particularities and differences and developing further the idea of computer clubhouses from the U.S. (Kafai et al., 2009), by involving parents and neighborhood communities, and allowing for a greater amount of conceptual flexibility.

To communities which – due to migration movements – are in a process of constant development and change, open places like the intercultural computer clubs come_IN can play an important role because they may serve as a place to negotiate *the needs of the present*, at the same time leaving room for future newcomers to join into this process of negotiation. For future work in the intercultural computer clubs, this sustainability perspective will continue to help focus on this openness when further developing and strengthening the newly grown computer club network.

6.12. Acknowledgments

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Part IV.

The Computer Club and the Individual

7. Lifecycles of Computer Clubs: Rhythms and Patterns of Collaboration and Learning in an Intercultural Setting

7.1. Abstract

This long-term study analyzes the structure of a technology-mediated local initiative fostering cross-cultural understanding and respect: come_IN intercultural computer clubs provide open yet guided access to modern information and computer technology and offer a space for computer-related collaborative practices of children and adults in intercultural German neighborhoods. Our study addresses problems associated with "cultural integration" and attempts to solve them through this provision. It reveals rhythms, lifecycles and breakdown situations which, transferred to a general level, form the basic structure for a sustainable implementation of a technology-related local initiative fostering cross-cultural understanding and respect. The study is based on field notes taken in three of these clubs.

7.2. Introduction

With increasing numbers of people seeking for access and then societal participation, migration is a major issue affecting societies around the world. This entails the question how cross-cultural understanding and respect can be fostered. Managing change in a way as to produce sustainable integration is a non-trivial matter, depending on agreement about specific policy implementation. Here, we present the results of a project founded on a clear implementation policy and reflect on practical consequences. How to achieve cross-cultural understanding and respect is a question that has been approached from diverse ends (Miles and Thränhardt, 1995; Schiller et al., 1995; Snel et al., 2006). Integration takes place locally. This slogan sums up recent insights regarding political and economic policy in Germany. Cultural and economic integration is regarded as a "bottom up" process whereby local initiative eventually translates into structural change, such that core values, common rules and mutual knowledge of and respect for social or cultural differences will become embedded in German society (Berry, 1984, 1992; Schuck and

Münz, 1998). Initiatives that address these aspects are numerous, encompassing various parts of life. In 2007 these have been systematized in a National Integration Plan, providing overview on integration success in measurable steps (The Federal Government, 2007). Central areas include language, education and work, community, sports, media, culture and arts. Of course, such policy statements and their implementations do not necessarily translate into successful practice and there is a clear need to evaluate practices to see "what works", what does not and – equally importantly – why.

A special focus of German policy lies in projects addressing the unequal access of migrant communities and mainstream society to computer infrastructure. That is, a central assumption is that the "digital divide" remains (e.g. Norris, 2001; Wagner et al., 2002; Witte and Mannon, 2010): equal access to computer technology and modern media (and skilled handling thereof) are expected to be pre-requisites for access to many parts of modern work life and education; also, technology mediated interactions can widen the space for the creation of a mutual knowledge base, shared understanding of cultural differences and common ground among immigrant communities and mainstream society. Having said that, it is important to understand what the dimensions of this unequal access might be. Highly generalized appeals to "culture" may overlook gender, age and other differences which impact on the divide. Some parts of our effort, therefore, are concerned with recognizing how these more specific factors manifest.

As part of this effort to understand how "integration" might be better achieved and how to structure good practice, we have conducted a research project over the last ten years centering on the question of how the digital divide can be bridged. For this, we have founded a network of six intercultural come_IN computer clubs in socially and culturally diverse neighborhoods. They provide open yet guided access to information and computer technology. Also, they offer a space for computer-related collaborative practices of children and adults, thus supporting the development of community structures and language skills. Our study addresses the issue of how to generate a sustainable implementation of a local, technology-related integration initiative. We structure our analysis and argument as follows. We first give a brief overview on the theoretical discourse around the use of ICTs for integrative purposes. We then describe the background to the development of the come_IN computer clubs in Germany. The subsequent in-depth analysis of these clubs and their activities, we will argue, reveals a number of strengths and weaknesses. This evaluation provides a basis. From there, we derive the general structure of a concept that may serve as a blueprint for others who are aiming to sustainably implement a technology-related local integration initiative. The contribution of this paper is the development of a set of guidelines for how the interplay of social interactions and their technological support can work in an intercultural and intergenerational local context.

7.3. Related Works

The concept of the come_IN intercultural computer clubs was mainly inspired by the US concept of computer clubhouses (Resnick, 1996). Since 1993, when the first club was opened in Boston, the US model has explicitly addressed inner city youth with educationally and socially deprived backgrounds. Relying on principles of situated, collaborative learning and constructionist thinking, the clubhouse's main focus lies on the development and strengthening of individual skills, confidence and creativity. The computer clubhouses open up opportunities for disadvantaged local communities in the cities and their success is well documented in research (e.g. Kafai et al., 2009; Resnick, 1996; Resnick et al., 1998). With the establishment of the come_IN clubs in Germany, the US model of computer clubhouses has been developed further to support foster cross-cultural understanding and respect at the local level, and support intercultural and intergenerational learning. The main incentive is the establishment and strengthening of local relations between different ethnic groups (Schubert et al., 2011; Stevens et al., 2005), thus promoting a positive impact on identity formation processes (Weibert and Wulf, 2010).

The background to such initiatives lies in a public discourse on integration in Germany, dominated by two larger themes, both of which have been subject of intensive and often emotional debate (Janssens et al., 2010). Firstly, the so-called "digital divide" describes the discourse on unequal access by migrant communities to computer infrastructure compared to mainstream society (Norris, 2001; Wagner et al., 2002; Witte and Mannon, 2010). Secondly, there is a discourse on so-called "Parallelgesellschaften", which we may translate as "parallel societies", and which describes processes of ghetto-ization such that migrant communities live with little or no contact with host culture. This is tied up with issues of multiculturalism (Klopp, 2002) and debates about the complex relationship between host and immigrant culture (e.g. Lofland and Lofland, 1995).

We are specifically interested in two dimensions of integration. The first – the structural dimension – is concerned with equal access to all aspects of societal life, such as justice, governmental institutions, education, labor, standard of living, and social security. The second – the cultural dimension – deals with a common basis for living that is based on common language, shared core values, common rules and mutual respect for and knowledge of social and cultural differences. We adopt Charles Taylor's perspective, such that integration at the cultural level is seen as the dialogic or interactional process which constructs identity (Taylor, 1994). Immigration as the starting point of an integration process (e.g. Berry, 1984, 1992) is seen to be followed by different forms of adaptation: integration, accommodation, separation, and marginalization. Important factors for the integration progress are identified in attitudes towards one's own identity as well as the intensity of one's relation to other societal groups. However, what is arguably missing from the discourse (and would be implied in Taylor's view) is recognition of two facts. The first is that "culture" is an abstraction and called into play by participants much less often than "community", "family" and "neighbourhood" as sources of identity construction and maintenance. As we shall see, such allegiances are central to the task of making activities

relevant to participants. The second is that these processes are not smooth. The rhythms of interaction; the longer-term lifecycles we observe, and the occurrence of breakdowns, all mediate the integration process.

This notion of rhythm and recurring patterns has been thoroughly looked into in research in the health-care sector, covering clinical (e.g. Reddy and Dourish, 2002; Strauss Anselm et al., 1985; Zerubavel, 1985) as well as non-clinical settings (e.g. Moen and Brennan, 2005), and the interdependence of both (e.g. Aarhus et al., 2009; Chen, 2011). It has helped to understand what Reddy and Dourish call "orienting features" (Reddy and Dourish, 2002, p. 344) in complex environments, and what Jackson et al. (Jackson et al., 2011) identified to have four central forms – *organizational, infrastructural, biographical*, and *phenomenal* – in collaborative scientific work settings.

Following Taylor's view (Taylor, 1994) and the argument above, we see progress in integration processes be dependent on the interplay of a number of factors from various parts of life. For example, progress on the job market cannot be looked at without regarding the development of intercultural equality in education, and education matters cannot be judged upon without taking into account the local community structures. Typical studies in the field however, rarely bring together these different perspectives and interactions of different societal actors, instead focusing on single aspects or actors (e.g. on the role of the media (Weber-Menges, 2005), or on education (Woellert et al., 2009)). With regard to the impact of technological interventions on integration processes, researchers only recently started to discuss various perspectives together, focusing on their value and effect for a sustainable diversity (Janssens et al., 2010). In Germany, this has culminated in a National Integration Plan (The Federal Government, 2007) that encompasses aspects of language, education and work, as well as local community structures, sports, media, culture and arts.

So, the necessity of a holistic approach has been recognized in principle. As yet, however, it has been less well evaluated, especially through close empirical study. The long-term analysis of the development of come_IN clubs that we offer here, then, provides an assessment of these ambitious proposals at a local level. Our case study contributes to a better understanding of the constituents necessary for the sustainably lasting implementation of a local, technology-related integration initiative. It reveals practical problems, identifies possible solutions and describes useful practices for the successful implementation of this holistic approach. The focus of our analysis is the interplay of social interactions taking into account the factors mentioned, and their technological support in an intercultural, intergenerational context.

7.4. Intercultural Computer Clubs

come_IN clubs offer a place for shared practice in a non-directive environment by children and adults. Mostly located in schools in intercultural neighborhoods, they bring together people of different migration background and age to work on joint projects or individual

enterprises, study or play. By focusing their collaborative project work on "community", "family" and "neighbourhood" as sources of identity construction, the computer clubs are designed to make a contribution to the development of a new understanding of the neighborhood and one's individual role in it – a prerequisite to the fostering of cross-cultural understanding and respect on the local level. Three principles are important: a) the support of individual and communal creativity, b) joint project work with computers and other modern media, c) a close link between project work, local neighborhood issues and ideas generated by participating children and adults (Schubert et al., 2011; Stevens et al., 2005; Weibert and Wulf, 2010).

The neighborhood has a large impact on computer club project topics, e.g. when magazines about the neighborhood are created, an animated film about friendship is made, or a board game is created by means of MIT's programming environment, Scratch (Maloney et al., 2010). These computer-based projects help to establish and strengthen relationships in the neighborhoods and provide interactional resources which – in some cases – children and adults might not have (gender issues, e.g., along with language barriers, restrict opportunities for some women to engage with the host culture).

This approach of the come_IN computer clubs ties in to the national striving for integration on two levels. For one, participation in the computer club encompasses the opportunity to gain in eloquence with regard to speech and the confident development and negotiation of opinions and perspectives across ages and cultures. And secondly, it also enables technology appropriation and use, thus helping not only the bridging of the "digital divide", but also fostering the chance for equal participation in the various parts of public life, most prominent among them the work sector. With this, the computer clubs assess central elements that have been identified in the National Integration Plan at a local neighborhood level: acquisition and broadening of language skills, education and work, as well as the strengthening of (neighborhood) community ties.

The first come_IN computer club was opened in a medium-sized city in the Rhineland in 2004. The transferability of the concept was tested with the opening of the second computer club in a mid-size town in the Siegerland in 2006. Here, experiences from the first club have been used to enhance social and technical aspects of the concept through participative means. Discussions with club members about previous and proposed activities took place, a more flexible way of playing and working in the club was agreed, and new equipment which better allowed for mobility (i.e. laptops) purchased. Also, the club's file repository got a new structure with personalized logins. The foundation of subsequent clubs followed in 2009. Two are located at a school-center in a mid-size city in the Rhineland, where older children were explicitly targeted. In a small city in the Siegerland, senior citizens adopted the concept in a joint initiative with teenagers in a youth center. A neighborhood initiative founded another club in a primary school in a large city in the Ruhr area.

General structures, rules and practices derived from the pilot club were introduced in all other clubs as they have proven to be successful in practice. Central to this is the voluntary nature of participation: originally, both children and parents were required to

Figure 7.1.: Some clubs keep project sketches and open questions in a "treasure box of ideas".

join the weekly club meetings to work, learn and play together but this rule was relaxed after a while, and children who could not participate together with a parent (e.g. because the latter had to work during club time), were encouraged to join come_IN together with another family member or friend. In general, club work is guided by a school teacher and tutors from our research team. The course of each of the one and a half hour long club sessions follows a tripartite structure: 1) the official club meetings start with an initial discussion round about work in progress and/or new projects, 2) the main working period and 3) the closing discussion round about problems, highlights of the day's club session and an outlook on upcoming activity. A 15-minute time slot is provided before the club meeting starts, where children can play and adults have time to commute.

7.4.1. Technical Support for Common Club Practices

On a material level, special attention is being paid to support the sharing and development of ideas and creative work among participants in the clubs and beyond. Some clubs keep a "treasure box of ideas", a wooden box where children and adults write project plans and ideas for activities on paper cards to make them accessible for later times (Figure 7.1). This support structure was also implemented to ease the integration of newcomers into the computer club community, as it provides them with a set of ideas.

Also, an online community platform called come_NET has been introduced to the clubs in order to support their emerging network and to promote the communication among club participants and shared practice over distance by providing various communication features (Figure 7.2). It uses metaphors, such as 1) a virtual blackboard for entries that are written and read only by participants of the same club and 2) a common, but user-group oriented, mail function. Furthermore, participants can set up a profile, create a photo album, add friends or search for club projects. The platform with all its features

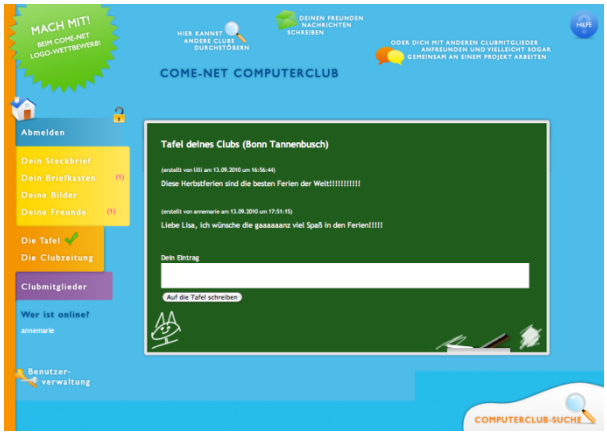

Figure 7.2.: The community platform promotes shared practice.

has been built up and evaluated to meet the needs of participants in the clubs with regard to age and technological fluency.

7.5. Method and Data

As an evaluative study we are specifically aiming at an understanding of the relationship between stated policy and practical outcomes: the focus of this paper is the description and analysis of lifecycles and breakdown situations in a computer club. It uses qualitative methods, and relies on field notes and transcripts collected as part of a participatory action research (McTaggart and Kemmis, 1988) perspective. This means that members of the research team are active participants in the computer clubs and routinely act as tutors (and indeed have done so since their inception). Jottings have been taken by tutors during the weekly club sessions and were then completed to full field notes. Their focus in very general terms has been the observable collaborations and interactions of children and adult club participants, their appropriation of media and computer technology, and associated processes of learning and social integration. For our study, field notes constituted the main resource, collected over the period mentioned below. With this situated participatory action research setup and long-term perspective, our evaluative study falls in line with works from the fields of HCI, computer-supported collaborative work and learning, taking a situated approach to the evaluation of (socio-)technical interventions in complex social settings. Neale et al. (2004) have laid out the scope of complexity: "Individual cognitive factors must be considered, as well as cooperative and collaborative factors, usability issues for individuals and groups (ease of use, effectiveness, efficiency, satisfaction), the social and organizational impact, and the larger context that situates the other factors." (Neale et al., 2004, p. 113). In their study of computer networking to teach writing, Bruce and Peyton have aimed evaluation at an understanding of "the process whereby realizations of an innovation are generated and to provide insight to

practitioners attempting to implement innovative approaches" (Bruce and Peyton, 1990, p. 171). Like Twidale et al. (Twidale et al., 1994), Bruce and Peyton emphasize a need "to include a 'situated' component, which seeks to understand how that innovation looks in each of its different contexts of use" (Bruce and Peyton, 1990, p. 190).

7.5.1. Data Collection and Analysis

Central to the study presented here are those three clubs from the computer club network that are located in primary schools. The material we present is taken from a total of eight years of field notes in the case of club A, five years of material in club B, and two years in club C. Participation typically consists of eight children and two mothers in club A, eight children and four to five adults in club B, and club C sees seven to ten children and five to seven adults every week.

It is important to note, that participation in the computer clubs is voluntary and free for everyone in the neighborhood. Participating children and adults are informed about the accompanying research project aiming to equalize access to modern information and computer technology, as well as to support the building of local communities across age, social, cultural and migration differences. Participants are assured that no identifying information is revealed about them. As part of the participatory action research approach, all participants are regularly invited to give feedback on the computer club structure, on completed projects and activities, and thus participate in shaping the overall club structure and course of action. Coding of material (Lofland and Lofland, 1995; Strauss and Corbin, 2004) was guided by our focus on the interplay of social interactions and technological support in an intercultural, intergenerational context.

In a first step, we read through the data to identify recurring patterns in the observable collaborations and interactions and their technological support in the computer club. These in hand, we comprehensively coded for the following areas: *Group Experiences, School Year, Project Work, Club Sessions, Completion of Tasks, Individual Involvement* and *Material Matters*.

7.5.2. The field

Even though similar in their socially and culturally diverse nature, each of the clubs and neighborhoods in focus has its own characteristics. As they are central to the study presented here, we give an overview on each one in the following sections.

City A

The foundation of the computer club in a primary school in city A was made possible above all by the engagement of the primary school's headmistress and a number of parents from the school that educates around 200 children. As there was no IT equipment readily

available for the club in the school, it had to find local sponsors for their desk top PCs. Right from the start, the club had a lively awareness of the surrounding neighborhood and conducted several projects with a strong link to it, namely the creation of little brochures called "Neighborhood Stories" about nice as well as disliked places in the quarter, or a soccer tournament with a neighboring Turkish soccer club that resulted in numerous photo and video artifacts. As there were especially mothers accompanying their children, a women's group was active within the club over a period of time, e.g. creating a film about their migration experiences, meeting to cook and eat together, and learning the language.

With regard to cultural background participation in the club is mirroring the general neighborhood structure, Turkish and German children making up for the largest share of computer club participants. 27.8% of the population in this neighborhood of city A does have a migration background (compared to the city as a whole with 22.4% migrant population), the largest share of which is of Turkish descent, many of them originating from the same region, even the same town, in Turkey. Within that context, the school knows about its significance as a central meeting place. On the school's website it says: "As especially families with migration backgrounds often times live together in very confined space, our school with its outside terrain is an important meeting place for mothers and their children." Participation in the club varied greatly over the years, roughly speaking consisting of an average of eight children and two mothers, but with peaks of up to 30 participants.

City B

The computer club in city B is the second-oldest club in the come_IN network. It was founded in summer 2006. Its foundation was part of a research project regarding the transferability of the come_IN approach. In search of a school as a project partner various primary schools in city B were visited. Diversity of the surrounding neighborhood, number of students with migration background and commitment of the school were some of the decisive criteria. This neighborhood of city B is a multicultural and diverse neighborhood with approximately 3.200 inhabitants; about 25% of whom has a migratory background. The neighborhood's primary school committed itself to the participation in come_IN with great engagement and therefore was chosen as a project partner. During the first months a series of workshops and meetings with teachers, students, their parents and neighbors were conducted to best match the structure of the prospective club to the local needs.

With regard to IT equipment, the computer club in city B had to start from scratch as no equipment was available for it to work with. For almost a school year the computer club sessions were held in normal class rooms using borrowed hardware from the university. During this time a room on the top floor of this small school's (approx. 110 students) historic building was newly furnished and equipped with IT to turn it into a combined computer club room and school library. With regard to cultural background, partici-

pation in the club resembles the surrounding neighborhood structure, with the largest share of people being of Turkish descent, followed by people from former Yugoslavia, Italy, Spain, Poland and Russia. More than half of the students have an immigrant background. An average of eight children and four to five adults participate in the club in city B. Approximately half of the participants form a kind of a core group that impels projects and the development of the computer club itself. Early on, many of the conducted projects were related to the neighborhood, e.g. wall calendars with neighborhood pictures have been created and an animated film about the friendship of a girl and a boy living in the neighborhood was produced.

City C

The introduction of the computer club in a neighborhood in the northern part of city C prompted immediate and lively discussion concerning the interests and individual needs of neighborhood inhabitants when the idea of the computer club was first introduced in local discussion rounds and neighborhood initiatives in summer 2009. Computer literacy was seen as important prerequisite for access to, and participation in, various parts of public life. The proposed computer club was expected to provide good help with regard to that matter for children and adults alike. Neighborhood inhabitants, a local non-profit organization and neighborhood managers worked together to bring the club to life in a primary school in the center of the neighborhood that does stand out in the city not only because of its high population density, large number of families, and comparatively young age structure, but also because of its rich diversity of nationalities, cultures and religions (57.7% of the neighborhood population does have a migration background), high unemployment rate, low incomes and restricted access to higher education. Almost every one of the 270 children in school knows two languages; one of the 20 teachers gives native-language lessons in Turkish; also the school offers Islamic and Alevi studies for the children, and provides a number of activities for parents and especially mothers – such as language classes, a "parent's café" and bicycle trainings. In this context, the computer club developed as a stable group of regular participants right from the start. Curiosity for the new opportunity and the demand for participation was high, so that the club established a waiting list and has kept it ever since. The club sees seven to ten children and five to seven adults every week. The migration backgrounds of participants reflect the diversity of the surrounding neighborhood, with children and adults from Turkey, Albania, Macedonia, Tunisia and Morocco.

7.6. Results

In the following, we present the empirical work which demonstrates rhythms, lifecycles and breakdowns which affect processes designed to be integrative. We argue, in the context of the clubs, that these take specific forms.

7.6.1. Group experiences

The first thing to note is that the clubs orient to a two-year cycle, because they are geared to the age policies of state schools. The come_IN clubs generally host children from 2nd to 4th grade, when they change to secondary school. Consequences are two-fold: 1) the club finds itself in need to promote itself in order to remain sizeable, and 2) social as well as technological expertise is endangered with certain persons leaving the club. Our study found all clubs to be well aware of the first aspect, and in all cases, the promotion of the computer club was a matter of personal advocacy – of children, adults and teachers. *"Tell your friends! Ask them, if they want to join!"*, the teacher in club B is heard to say regularly, as she encourages children and adults to actively promote the computer club. This can be done formally as well, as with club C, which established a waiting list of children who want to participate. *"Let's see, who we have there who might want to join"*, as the teacher put it when there places became available.

Club A and club B also advertised the club at classes and parent teacher meetings. The second feature is less well recognized, and is usually prompted by the recognition that a particular individual will no longer participate. As a teacher from club C said, *"We'll see how things will be, when she won't attend any more — she really holds things together"*, about a Turkish mother. The mother, the teacher reported, had developed *"the right touch in caring for a good atmosphere"*, e.g. by bringing tea or looking after children who had problems completing homework before joining the general club activity. And a tutor, who had to leave the club for work reasons, left a number of artifacts as visible proof of his expertise: under his guidance some rather tangible projects were made – e.g. the club had built loudspeakers from computer's hard drives, or tore a computer apart to learn about its functionalities before putting it back together.

7.6.2. The school year

Club activity takes place weekly. Participants gather to pursue their joint projects. This rhythm seems to match the children's abilities to keep track of their work's progress. When this pattern is interrupted, the consequences become evident. The questions that clubs routinely have to deal in these circumstances have the flavor of, What did I do last week? What was my plan to do next, when I was interrupted at the session's close? Where did I save my project?

These interruptions are largely a function of the school year, principally holidays. The most significant is the six week summer break. For the clubs these holidays form a caesura: after that, it is a new school year, with new subjects, new class mates, new rooms. Thus, club activity tends to fit with the breaks. Projects have to be designed to come to a "natural" conclusion before the break, material and other resources have to be managed in respect of this flow, and "presentational" activities tend to be organized with an eye on this. A film made in club C is a good example insofar as all of the above factors influenced its production, culminating in its showing at the school's end-of-term

celebration, with participating children explaining to the school assembly how it was created.

7.6.3. Project work

Projects themselves have a significant effect on the rhythm of the clubs, given the focus in the clubs on collaborative activity. They range in length from a couple of sessions to several months. The completion of one project and the start of a new one does, however, mark a hiatus. The club's joint discussion rounds are used for the presentation of completed club projects as well as the negotiation and planning of new project activity. Furthermore, we see club participants regularly gather for a "museum round" in club C, where each of the participants presents his or her share in the project to the others. Participants in club B jointly looked at their completed project work via projector. *"Can you explain to the others, how you did this?"*, asks the teacher encouraging children to present their skills and their share of the work to the others in the club. Club A addressed an even larger audience by distributing their written stories of the neighborhood as booklets in print, selling these "neighborhood stories" for a little money at school events or in public places like the library.

Nevertheless, friction can occur in the time in between a project's formal beginning and end. Children show varying ability to concentrate over a longer period of time – e.g. during an animation film project in the club in club C. *"But we made heaps of pictures already – aren't we done yet?"*, a 9-year old boy asks. Creating hundreds of still images, the children experience learning by doing, how much effort is needed to complete just one minute of moving film. Interruptions are also caused by unexpectedly complex tasks to complete. For the handling of these frictions, our study finds all three clubs placing emphasis on joint opening and closing sessions as a place to solve problems and share expertise. A field note protocol reports the teacher in club C asking: *"Does everyone know, what there is to do today?"* Another protocol describes the teacher from club B encouraging the sharing of expertise among the participants: *"Who knows how to do this?"*

7.6.4. Club sessions

The weekly club meetings are the basic components of each club's life. Here, project work is completed and – encircling this – social structures among the children and adult participants evolve. In general, club sessions are divided into a section of free time for individual play and work at the computer, and a part for the joint project work. Our notes from the very first sessions of club C see this division quickly established. Children and adults make use of the very first session to get to know each other, and then – triggered by the tutors' question *"Do you know what to do with the computer?"* – jointly discuss ideas what they might want to do and explore in their computer club (*"Play games."* – *"You can also use a computer to call home via the internet – my grandma*

does so!" – *"Make a movie."* – *"Write something."*). The next session is devoted to familiarization with the group, the room and the computer. Here, a first division of play-time and work-time is made, when the teacher ensures that children don't use the club session solely for playing games. After a couple of sessions, this division has settled: *"Can we start the computer?"* – *"May I play?"*, boys and girls would ask when entering the computer room for the club session in club C, moving straightaway to "their" computer in the room, before later joining the common project work in the club. Field notes also report on children who had so fully internalized the division of play and work time that they would ask for permission to "skip playtime" and resume last session's project work right away, when they were fond of a project. There is, not surprisingly, a disjuncture between adult and child in attitude. Adults are more likely to place a focus on outcomes and learning progress and sometimes rigidly emphasize the division of play and work: *"Now close that window, sit still and listen, will ya!"* one was heard to say.

In club A, some children and adult participants rejected the discussion rounds for being too time-consuming. They felt that they knew what to do next when working on a long-term project and did not want to lose time talking. As a consequence, the club dropped the initial discussion round for a while. But the rounds were soon resumed, when it became apparent that participants lost structure and motivation for their work. One field note protocol reports a vivid argument in the closing discussion round: unaccomplished goals that had been defined at the beginning of the club session became apparent when participants could not report on further progress because they spent club time entertaining themselves with game play or interest in other's activities. The respective session's field notes also record arguments over who had actually completed tasks as one participant "recreated" someone else's project, prompting the following exchange: *"He stole my idea!"* – *"No, I improved it!"*

In all computer clubs, we see tutors, teachers and parents be well aware of the significance of a cooperative atmosphere, where club participants are willing to share expertise and help others. Field notes record how one of the Turkish mothers in the club in club C would engage in supporting a boy in the completion of his homework before he was allowed to join in the general club activity of the day. In turn, that boy was seen to share his word processing skills when helping another design a questionnaire for a school class activity, or passing on acquired knowledge in the use of the programming environment Scratch (Maloney et al., 2010), and explain e.g. how to create a loop. Field note protocols from club B repeatedly report how teachers use the joint discussion rounds to facilitate collaboration by asking questions such as: *"Ok – who can help?"* And regularity in the club's session schedule even helped club alumni to keep in touch with their club long after they had left school. Ever since its foundation, club C has kept the day and time of its sessions stable – so, every now and then, club alumni would join, whenever their new school's schedule permits them to do so (*"I knew that you are here today – so I thought, I'd join."*).

7.6.5. Completion of tasks

The effective completion of a club project is comprised of several discrete efforts, some more successful than others, and all of which require some degree of coordination. Our data sees each of these situations divide club participants into experts and learners with certain skill levels. In club A there are participants who have already left primary for secondary school, but still participate in the computer club. They tend to have detailed knowledge of certain computer applications, such as Scratch or Gimp and are often introduced to new participants as, "our expert for…". On this very basic level, we find the key to the successful or failed completion of tasks in the openly structured club session. Help rather than instruction, encouragement rather than criticism are fostered among all participants. An example from club A indicates this:

> G: *"I lost my essay. Where's it gone?"* T: *"Did you save it?"* G: *"Nooo ...."* T: *"You do it like this."* (demonstrates) Girl produces short essay and again forgets to save it. T: *"Doesn't matter ... I'll show you what to do."* Minutes later. G: *"Look, I saved it by myself!"* In the following closing discussion she excitedly reported: *"First I didn't feel like writing again, but then I did."*

The open structure, where teacher and tutors can respond to children and adults individually, helps situations where traditional roles are reversed in front of the computer, and parents find themselves in a position as learner with their children teaching them. The club context can exacerbate this at times, putting some parents in a position where they do not only lack technological fluency but are also dependent on their child with regard to language. On an underlying level, the completion of tasks divides participants into those who are taken up with organization activity and those who are more passively engaged in project work. Our study sees all three clubs struggle to find a balance here, especially in long-term projects where small individual projects are condensed to one common group project (e.g. a game board that consists of several smaller games). Participants face situations where they feel over-challenged by complex tasks. Here, we see parents take over tasks, such as merging smaller games to one large game board or typesetting of a booklet that children would not be able to accomplish on their own. These issues are mainly dealt with in opening and closing discussion rounds.

7.6.6. Individual involvement

A further complication lies in the fact that individuals – children, parents and teachers – move on, especially where the person in question has a central role. Expertise, knowledge and moral authority can be lost in such circumstances. In club A, the founding teacher retired. As principal, she knew "her" school and its children and parents, and was known for her efforts in personally motivating people to participate in the club. Children and adults relied on her engagement with regard to the development of project ideas, planning of project activity and acquiring of resources. So, her retirement resulted in a decline in participation. It took time and effort for the club participants to reinvigorate the

club using methods such as making use of questionnaires distributed among parents to establish interest in the club and lines of engagement, and holding meetings where ideas were "brainstormed". This could also be seen in club A when a highly motivated Turkish mother left the club. She had coordinated organizational tasks, and encouraged other Turkish parents in the neighborhood to participate. Due to her migration background, it was easy for her to address other Turkish families and convince them to accompany their kids and join the computer club. Thus, her leaving affected the attendance of some Turkish parents and they left: For them, maintenance of strong community links was less possible after a key figure ceased to participate.

Similar individual difficulties arise over matters of "discipline". This was the case in club C when a boy was told by the teacher not to come to the club any longer, because he refused to take part in any joint project work and perceived club sessions as only entailing access to computer play time. Children in the club perceived this decision to be unfair and joint resolution became necessary, with the boy being conditionally allowed back.

Even in environments which are explicitly designed to be collaborative and informal, certain individuals have disproportionate importance for various reasons. These include knowledge and expertise; role in the wider community, and moral authority. It is interesting to note that even in these informal settings, teachers retain some of that moral authority and it influences the behaviour of children. We noted how the teacher in club A could not attend several club sessions in a row because he was involved in a musical course at the time, and this resulted in a rather unstructured mix of play and work activity. Children exploited the absence of the teacher, and some careful emphasis on intergenerational work from thereon had to be generated.

7.6.7. Material matters

Material matters occasionally produce breakdown situations that interrupt the larger lifecycles of club activity. Our analysis finds these occurrences to be a hindrance, making the continuation of project work difficult and even impossible at times. Most of these frictions concern the storage of the computer clubs project files, such as video, pictures, text documents, and Scratch files. Club A and club C did not have separate, secured storage space on the school's server at first, so they could never be sure that none of the other people in school accessed their data, transformed or deleted it, be it on purpose or by accident.

Both clubs first helped themselves by storing and securing files on a USB stick that either the teacher or a tutor would bring to each of the club sessions. In club A the problem was then solved by storing all data on a central shared hard drive in the local network. Since group and individual project work varies, participants store their data under the group project's name or in their personal folder. Club C benefited from the moving of the school into a new building: a computer room was setup and equipped with a new IT structure. Now, the club had a central shared hard drive, and club participants

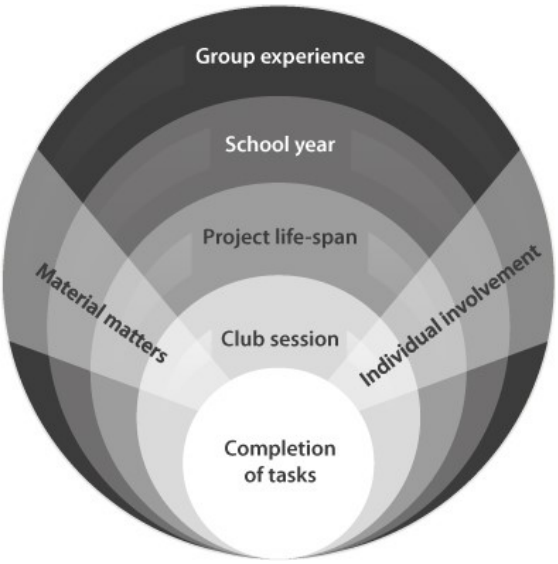

Figure 7.3.: Computer clubs develop in circular movements.

got personalized logins. Oddly, material problems could also have unexpected benefits. Absence of internet facilities in club B, for instance, tended to result in focused activity since there were fewer distractions available.

7.7. Analysis

We began by laying out the broad objectives of the computer clubs we are engaged with. These consisted in the main of fostering integration through educationally supportive activities and providing an educational environment that fostered collaborative, community-based activity. However, such objectives cannot be guaranteed. They require constant and active work in order for progress to be made. Further, they require attention to the rhythms, lifecycles and breakdowns that occur in order that policy can be developed which minimizes their effect. We have identified above some patterns that inform us about the interplay of social interactions and their technological support in an intercultural, intergenerational context.

In the following, we will show the circular nature of the above mentioned patterns by exemplifying two of the detected lifecycles: the project life-span being central with regards to club activity, and the club session representing the weekly, basic structure for this activity to unfold. We conclude our analysis with a discussion of implications for design that can be deduced from our findings, and structural connecting points for the online platform, come_NET, fostering and supporting the groupwork and collaboration in the clubs.

Lifecycle	Incident	Approach
Group experience	Every two years 4th graders leave for secondary school.	Clubs make: a) a waiting list (of children who want to participate) and/or b) advertisement among children and parents at classes and parent-teacher meeting.
School year	How to keep track of work in progress with regard to school-related recurring interruption (e.g. holidays).	a) Present project work in classes, parent- teacher conferences and at the school's end-of-term celebration. b) Use a "treasure box of ideas" to not start from scratch into the new school year. c) Advertise the club to parents via letter and at parent-teacher meeting.
Project lifespan	Not stringently planned long term projects.	a) Using opening and closing rounds as a place to solve problems and share expertise. b) Encourage the sharing of expertise among the participants themselves.
Club session	Children are eager to play and escape from project activities. Not accomplishing goals. Where can I find help for my problem?	a) Define goals in the initial round. b) Foster a cooperative atmosphere by paying attention to work in progress. c) Discuss next steps and problems in the closing round.
Completion of tasks	Participants can be divided in experts and learners.	a) Respond to children and adults individually. b) Let experts and learners work on common projects to share expertise.
Individual involvement	Expertise and atmosphere getting lost with someone leaving the club.	Sharing expertise beforehand. Personal motivation.
Material matters	Loss of data.	Secure storage of data. Personalized logins.

Table 7.1.: Overview on computer club lifecycles.

7.7.1. Project life-span

The life-span of club projects ranges from a couple of sessions to several months. Analysis sees their development follow a repetitive structure, consisting of: 1) collection of ideas for and planning of a project, 2) project work, and 3) its completion, punctuated by breakdown or interruption.

In all clubs we saw a close relation of the phases 1) and 3), such that successful planning in the main provided successful results. This was facilitated by established principles of joint discussion, clearly demarcated and where all were encouraged to participate. The joint discussion rounds serve as reliable club structure as it institutionalizes an audience for results and a forum for discussion. Nevertheless, during phases of club project work, our study saw interruptions be frequently caused by participants losing track of their work, by distraction or lack of concentration. Planned structures were mediated by contingency, but such contingencies were themselves mitigated by structures. There was, to use the classic language, a circularity of "plans and situated actions". Opening and closing rounds, in this instance, prove to be a dependable support structure.

7.7.2. Club session

Our study saw a tripartite structure emerge on the level of the weekly club session. Its components: 1) the initial discussion round, where goals for the day's club session are defined and work is distributed among participants; 2) the main working period, where teacher, tutors and parents foster a cooperative atmosphere by paying attention to work in progress and the distribution of relevant expertise to foster success. Opening and closing discussion rounds emerged over time, when the clubs had to develop a means to cope with technical and social problems and frictions that would typically emerge. On the social level, we saw the division of play time and project work cause tension when children would try to escape from group work for a while to play or kid around. We saw especially adult participants, in turn, focused on output and learning progress. On the technical level the clubs needed a place to decide upon and plan the general course of project activity, and to repeatedly come back to that plan ensuring that it was clear to all participants in the club. Our study saw friction occur when children lacked an overview of what to do next and how their individual task was needed for and would fit into the larger common project. Also, participants frequently did not have an overview on expertise and help at hand when encountering problems during their activities in the club. Our data sees these incidents occur over and over again – and finds all three clubs use the discussion rounds as a reliable place to resolve them.

7.7.3. Exploring Rhythms and Patterns

This exemplary analysis of the two lifecycles shows: each lifecycle is dependent on a balanced interplay of social action and technological intervention. It most importantly

involves the development of a stable social structure that is capable of absorbing recurring lifecycles, patterns and breakdown situations, e.g. loss of specific knowledge, expertise and moral authority when a participant leaves. Researchers have shown rhythm to be an orienting feature in multi-faceted environments to be significant in, for instance, the medical context (e.g. Reddy and Dourish, 2002; Woellert et al., 2009). Our study presented here reaffirms this insight in the educational context of computer clubs in intercultural neighborhoods.

We see this insight carried forward on the level of the other lifecycles as well – it even counts for individual involvement and material matters, which otherwise follow a rather irregular and unpredictable structure. We provide an overview in tabular form (Table 7.1). The analysis of the two lifecycles – as well as the tabular overview provided below – also shows: the course of each lifecycle is influenced by the interplay of careful planning and situated action. Participants in the clubs act and interact within planned structures, and every now and then have to react to incidents (like loss of data, lack of overview on data storage etc.) interrupting the smooth course of club activity. There is learning involved in this circularity of actions. Interruptions result in the establishment of computer club structures aimed at the prevention of repetition of the interruption: e.g. opening and closing discussions are set up as a place to plan activities and share expertise; a "treasure box of ideas" helps project plans not to get lost; experts and learners team up to secure that no one is left behind in common club project work.

Children take up a special role in all of this: Firstly, they are involved in design issues such as the development of the club's supporting online platform come_NET, thus taking up a position that has been researched by Druin (1999) and others (e.g. Chiasson and Gutwin, 2005). Further, children are – just like adults – equally involved in the design process of club structure and project work. Not only do they act as co-designers of club technology, but also have an influence on club and project structures.

7.7.4. Exploring the Design Space

Our case study finds clearly designed social structures to be most apt to meet local needs and maximize connecting factors, a finding that supports the results from Toombs et al. (2015) studying community maintenance labor in a hackerspace, extending it to a diverse local neighborhood setting. The open-door policy of our computer clubs maximizes connecting points to new participants, since there are no formal barriers to participation. The explicit local orientation makes for a strong link to everyday needs and interests of the diverse young and adult participants. Discussion rounds secure different opinions, so all are equally heard and empowered to determine the course of events in the club. Division of club sessions in play and project work time secures the seriousness of the initiative. This aspect of empowerment carries forward on the technology level.

Following principles laid out by Druin (1999) the newly designed online community platform come_NET is built from a user-centered and user-driven point of view, taking into

account specific needs and capabilities of the young and adult computer club participants. On the individual level, technical fluency, reading capabilities and the low attention span of children are considered (e.g. easy readable and short text, iconic and metaphoric representations to alleviate the problems emerging from language barriers, simple and fast two-step registration).

This especially attends to the lifecycle of the club session, where our study identified a need for reliable structures supporting a great variation of technological fluency and focus. On the community and collaborative project work level of the project life-span lifecycle, come_NET supports club activities by means of functions for communication and shared practice such as a club "internal blackboard" supporting the collaborative project workflow: here, each club can announce and keep track of the sequence of project actions. Due to the fact, that the storage of data often causes frictions with negative effects on ongoing project work, come_NET can provide a central storage location – thus mainly attending to the lifecycle of material matters. Data loss is prevented and an opportunity to extend project work beyond the regular weekly club sessions provided. Also, come_NET browses the computer club files to provide a search facility: participants can search for similar documents to become inspired or use it for an idea of their own.

By providing functions to list, share and store project ideas, aforementioned problems caused by school year related recurring interruptions (e.g. holidays) are eased. To follow social integration between club members and the neighborhood, easy to use communication functions (e.g. virtual black boards, discussion forums, chat) are provided. With this, the platform speaks to the individual involvement lifecycle as it distributes responsibilities among many and raises awareness among participants for their activities.

7.8. Conclusion

Our study shows that the ambitions for an intercultural, collaborative educational experience designed to facilitate integration are worthwhile and ultimately realizable. However, this necessitates close attention to the rhythms and breakdowns that form part of the larger lifecycle. Our study investigated the constituents for the sustainable implementation of a local, technology-related integration initiative. The close relation of social interaction and technology matters is key, come_IN offering the chance to gain in technological fluency – not for the sake of learning alone, but also to be culturally embedded in local matters. There is a crucial social dimension to this: by means of conducting joint projects of local relevance, children and adults learn to voice opinions, too – they develop skills of listening to the perspectives of others, to value their opinions and to compromise.

Over time this implies an enhanced view of the neighborhood and one's own share in it, as well as advancing language skills to elaborate on this – both prerequisites for integration. This is an effect that is not straightforwardly measurable but is, we believe, qualitatively evident. The openness of the concept which puts people of very diverse backgrounds

with regard to origin, cultural background, age and IT knowledge in an equal position as learners maximizes connecting factors.

Generalizing from this setting, we see challenges unfold on several nested lifecycles. The sustainable implementation of a technology-related local integration initiative involves the development of a stable social structure: capable of absorbing the loss of specific knowledge, expertise and moral authority when an engaged participant leaves. This insight reaffirms Reddy and Dourish's notion (Reddy and Dourish, 2002) of rhythm as an orienting feature in complex environments that they among others (e.g. Zerubavel, 1985) have studied in health care, extending it to the educational setting of computer clubs in intercultural neighborhoods.

We extend the work of Druin (1999) further by involving participants as co-designers of social club structures as well as project outcomes. Time is the connective factor to the lifecycles – relating, in our case, to the time span of a school year, and the time needed to conduct a club project. Sustainably implementing a technology-related integration initiative involves the development of an eye for, and reaction to, the main recurring interruptions that the respective setting brings about. It involves careful planning of activities in order to involve all participants, reflecting their motivations and abilities, and fostering a cooperative atmosphere among them. Here the next lifecycle is linked in, encompassing the weekly order of activities, structuring them in a way that leaves no one behind: providing ways to share expertise, keeping project tasks challenging yet not over-complex. The sum of local contingencies which engender relative failure or success in turn engender lifecycles which determine the lasting implementation of a technology-related integration initiative on a most basic level.

Tangible matters, e.g. of mal-functioning materials, affect this in contingent ways. But they do not determine outcomes once the mobilizing of group experiences through the social structures which have evolved and become planned for, mitigate their effects. The computer club initiative has existed for more than ten years now, and the network grows. With the current political situation with rising numbers of refugees and migrants especially from Middle Eastern and African countries seeking for access and then participation in society, the initiative's societal concern prevails.

Our evaluative study indicates that a future key to the support of lively computer club activity can also be of virtual nature: come_NET enlarges the possibility of integrating different cultures in the clubs by overcoming cultural and geographical distance. Its utilization fosters a) communication and maintenance of club relations and thereby its participants and b) exchange of ideas, knowledge and material, and with regard to common project work within the clubs, even online cooperative work.

7.9. Acknowledgments

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8. How the Social Structure of Intercultural come_IN Computer Clubs Fosters Interactive Storytelling

8.1. Abstract

Narratives constitute an important framework for the shared computer practice of children and adults in intercultural computer clubs come_IN. Located in schools in socially and culturally diverse neighbourhoods in Germany, the clubs' aim is twofold: they are a place for children and adult members of the neighbourhood community to voluntarily gather and:

- share and develop ideas and perspectives, at the same time
- acquiring and broadening skills and thus technological fluency in the use of modern media and computer technology.

Our comparative analysis of a film project that was conducted in two different come_IN computer clubs shows the potential of this informal learning setting with regard to childrens' interactive storytelling. The study is built on qualitative data from active and observing participation in the club sessions, as well as the analysis of artefacts created during the project work in the two clubs.

8.2. Introduction

Understandings of what it takes for increasingly culturally and socially diverse societies to integrate are numerous – as are the attempts to put these into practice in everyday life. In Germany scientific and public discourse, as well as practical approaches on the subject matter unfold on two different levels. Integration is recognized (Berry, 1984, 1992; Schuck and Münz, 1998) to have a structural dimension that is – matter-of-factly – concerned with equal access to all parts of societal life. Its second dimension is cultural, dealing with a common basis for living. The elements of this cultural basis, such as common language, core values, common rules and mutual respect for and knowledge of social and cultural differences, are often discussed with great emotion.

Scientific research indicated that integration remains incomplete if only one of its two

levels is being addressed. Exploring the process from the literal meaning of the Latin word *"integrare"*, meaning "creating a unified whole", one can easily identify equal access to and participation in all parts of everyday life and society to be a crucial prerequisite. But society as a "unified whole" of culturally diverse parts could not be without the social, cultural element of negotiating and creating a common basis for living among these diverse societal parts. Consequently, in scientific and political integration discourse the immigration into a different country is seen to be the starting point of an integration process (e.g. Berry, 1984, 1992), followed by different specifications of adaptation: integration, accommodation, separation, and marginalisation. The attitude towards the own identity as well as the intensity of one's relation to other groups are seen as important factors for the progress of integration processes.

So, what does this imply for the structure and organisation of local integration efforts? Their success is found to be dependent on learning processes touching upon both, the structural as well as the social and cultural level of integration. On the structural level, it encompasses learning processes as a means of gaining access to knowledge and skills as necessary prerequisites for equal participation in the various parts of everyday life. On the social level it means the creation of a mutual knowledge base and shared understanding of cultural differences and common ground among immigrant communities and societal majority.

Being concerned with social aspects of integration by offering a space for computer-related collaborative practices of a neighbourhoods' mainstream and migrant groups, and aiming at structural matters of integration by contributing to the bridging of the "digital divide" and providing open, yet guided access to modern information and computer technology, the computer clubs come_IN follow a decidedly open structure here. Participation in the clubs is voluntary and free; topics for project work are developed by the child and adult participants themselves and then jointly agreed upon; tutors and a teacher provide help and guidance but do not set up a predefined schedule to follow for the clubs' weekly meetings.

Despite this openness, there are structural elements in the come_IN clubs' weekly activities: narratives can be observed to constitute an important framework in this informal learning setting. With regard to project work in the clubs, they provide structure to the exchange of individual ideas and perspectives among the young and adult participants. Especially, on the side of the children a twofold learning effect may be the outcome: it encompasses the opportunity to gain in eloquence – with regard to speech and the confident development and negotiation of opinions and perspectives across ages and cultures, as well as with regard to technology appropriation and use. It is the aim of this study to reveal the setup and interplay of conditions necessary for these learning effects to unfold.

Our argument is organised as follows: we first give an overview on the concept of intercultural computer clubs come_IN. We describe their development in the context and tradition of US computer clubhouses, and following constructionist thinking, situated and collaborative as well as concepts of narration-based learning. We then briefly describe the come_IN clubs' establishment and work in socially and culturally diverse neighbour-

hoods in Germany. Our close and comparative analysis of an exemplary project that was conducted in two different computer clubs reveals the necessary conditions to make these narration-based learning processes and effects unfold in the informal club setting of come_IN.

8.3. Related Works

With the establishment of intercultural computer clubs come_IN in Germany, the US computer clubhouse concept has been developed further and applied to issues of integration of migrant communities. Thus, the work presented in this paper, draws on different fields of research. It builds on the US computer clubhouses' principles of situated learning and constructionist thinking. In the USA and around the world, these clubhouses have opened up many chances and opportunities for disadvantaged inner city youth since the first club was established in Boston in 1993. Their structure and success is well documented in research (e.g. Kafai et al., 2009; Michalchik et al., 2008; Resnick et al., 1998). Their main focus lies on the development and strengthening of individual skills, confidence and creativity.

Storytelling is a second field of research that does play an important role in the structuring of the informal learning setting of intercultural computer clubs come_IN. Stierle (1984), Bruner (1991) and Applebee (1978) have described storytelling to be not only a mere amusement and pastime but a way of processing and developing personal experiences and ideas – a means to "exemplify actions, events and meaning, and to organize experiences" (Mangold and Woletz, 2007, p. 40). Numerous researchers have elaborated on this informal, narrative building and transfer of knowledge; Bruner (1991) and Mitchell (1981) recognised a cultural dimension that is concerned with social ties among people, and an individual dimension that looks at the structuring of personal experience.

How can this approach be helpful on the local level of an intercultural neighbourhood? In the informal learning setting of an intercultural computer club, storytelling is a way of processing individual and neighbourhood experiences by means of modern (computer) technology. Not only on the side of the children this opens up the opportunity to gain in eloquence (e.g. Applebee, 1978) – with regard to speech and the confident development and negotiation of opinions and perspectives, as well as with regard to technology use. The focus on the narrative structures circling around project work in the intercultural computer club deepens our understanding of how and why this local initiative can contribute to integration processes.

8.4. come_IN Computer Clubs

Where the US computer clubhouse approach has a strong focus on the development and strengthening of individual skills and thus opportunities, the focus of come_IN mainly

lies on community dynamics and the strengthening of social ties – on the local family, school and neighbourhood level. The first come_IN club exists in Bonn Nordstadt since March 2004. The neighbourhood has a large influence on project topics and activities (Stevens et al., 2005; Veith et al., 2009) – e.g., when small magazines about the neighbourhood have been created, shared experiences like a two-day trip to Berlin or a soccer match with a neighbouring Turkish soccer club resulted in photo- and video-projects, or have been processed by means of MIT's visual programming language Scratch (Maloney et al., 2004; Resnick and Silverman, 2005).

In Siegen Wellersberg, the transferability of the concept was tested in 2006 with the establishment of a second come_IN computer club. The experience gathered in Bonn helped to refine social and technical aspects of the concept. An opening and a final short discussion round was established where all club members gather and talk about current and prospective activities. Also, a more flexible way of playing and working was enabled by retrofitting the club-equipment of stationary PCs with mobile laptops, at the same time structuring the clubs file repository with personalised logins.

The come_IN initiative started growing into a network just recently. Four new clubs have been founded in summer 2009:

- A school complex in Bonn-Tannenbusch with primary school, secondary modern school and grammar school on one site brings together children, teenager and their parents in two clubs.
- A neighbourhood initiative in the Nordstadt of Dortmund established a club in a primary school.
- Senior citizens in Kreuztal adapted the come_IN concept for their idea of a computer-project with teenagers in a youth center.

The aim to support and strengthen community dynamics and social ties across generations as well as cultures is reflected in the come_IN computer club setting and structure. A focus lies on the structural as well as the social aspect of integration (Table 8.1).

Most of the clubs are located in primary schools: in intercultural neighbourhoods in Germany the schools are the place to inevitably meet for people of different backgrounds (e.g., economical, educational, and migration). Thus, the school as the clubs' location can be assumed to be a starting point for social interactions that do not have to start anew but can draw on something familiar, on shared experiences.

A basic rule for the computer clubs' weekly two-hour meetings is that children should participate together with a parent. This rule was changed after a while – children, who could not join the club together with a parent (because parents had to work during club time), were encouraged to join come_IN together with another adult family member or friend. The general idea behind this: to use project work in the clubs as a trigger for intergenerational learning experiences that ideally find their continuation in family and neighbourhood contexts.

"come_IN"	Structural Integration	Social Integration
School Setting		Common ground in the intercultural neighborhood.
Intergenerational Participation		Trigger for learning experiences that may continue in family and friendship contexts.
Collaborative Projects	Task-related appropriation of technology. Equal position of club participants as learners; sharing of skills.	
Technology	Bridging of the "digital divide" by providing open access.	
Discussion Rounds	Development of skills in the voicing and negotiation of ideas and opinions.	
Treasure Box of Ideas		Starting point for interaction among club participants.

Table 8.1.: Aiming to support integration processes on the local neighbourhood level, come_IN computer clubs follow a decidedly open structure.

Also, project work in the club is conjointly decided upon. This may result in larger projects involving all club participants, as well as smaller project activities being conducted in parallel and involving fewer participants each. To plan and coordinate all club activity among the young and adult club participants, an opening and closing discussion round was established. When it became apparent that it would be difficult to get the voices of children and adults equally heard in these decision processes, it was decided that one child and one adult per session would team up to jointly moderate the opening and closing rounds.

In order to make ideas accessible for later times, some of the computer clubs keep a "treasure box of ideas", a wooden box where children and adults write their project plans and ideas for activities on coloured paper cards.

8.5. Method of Research

Principles of participatory action research (McTaggart and Kemmis, 1988) guide the accompanying come_IN research project: Information on collaboration and interaction of children and adults participating in the various clubs, their appropriation to media and computer technology, processes of learning and social integration is gathered from narrative interviews with club participants, group discussions, audio and video material.

This qualitative social research is combined with active or observing participation in the clubs weekly sessions. Accordingly, we participate in this field that is characterised by numerous differing roles and sub-groups. *"Researcher"* is just one role, just one realisation of legitimate peripheral participation within the community of come_IN. *"Tutor"* is another role that is taken by students and us during normal club sessions. The qualitative data for this paper's description and analysis of learning processes resulting from collaborative project work in the clubs stems from field notes that have been taken by tutors during the weekly club sessions.

The analyzed project example from the club in Dortmund lasted for 18 club sessions; five to seven women and seven to twelve children participated in each of the sessions. The project example from Siegen took approximately 15 club sessions to complete; five to seven adults and five to eight children took part. Also, we discuss and analyze the artefacts created during the project work: these are a storyboard that was designed with the help of MIT's visual programming environment Scratch, a written storyboard on paper, and a three-minute Trickfilm for the side of Dortmund; the project in Siegen resulted in a written storyboard on paper, a two-minute Trickfilm and a huge poster being the background during filming, later used as a decoration of the computer clubs' room.

8.6. Storytelling in come_IN: collaborative project work in the club

The following comparative analysis of a film project that was conducted in two of the computer clubs reveals how the above described come_IN setting and structures may or may not unfold their integrating learning effects over the course of a computer club projects' life span.

8.6.1. Creation of a Trickfilm in Siegen

During the first years of the computer club in Siegen there were a stable group between 10 and 15 participants. At the very beginning they chose projects dealing with digital photography. Children and their parents decided to take pictures of the neighbourhood, later using them to design calendars, greeting cards and similar things. Being satisfied with the exploration of digital photography, and the creation of static digital pictures after a while, most of the children in the club wanted to tell a story in pictures. Taking a video was the next logical step. First attempts of replaying a computer game in a video were quite a lot of fun, particularly for those acting as an avatar. But participants also experienced the hassle of post-processing: cutting, editing and setting to music were complex and time consuming.

In one of the club's following joint discussion rounds the teacher had another idea: the production of an animated film using the "Trickboxx". This wooden box with spotlights as a "stage" and a digital video camera may be borrowed from the German children's channel Kinderkanal ("KIKA") for this kind of film projects. The idea was enthusiastically accepted in the club and the participants jointly prepared the written proposal for a story. In this proposal the computer club was shortly introduced, and the idea of a film about friendship was presented. The proposal was sent to the "KIKA" and was accepted some weeks later. The letter of acceptance informed the club that the "Trickboxx" would be available for the club for the duration of one month, shortly after the beginning of the upcoming school year.

At the beginning of the new school year all participants prepared for the arrival of the "Trickboxx". A storyboard was created with pen and paper. The children wanted to make their film be about the friendship of a girl and a boy living in the same neighbourhood. They should accidentally meet each other during the girls' search for her dog that had escaped from her during a stroll. The club children's different experiences in their own neighbourhood during the recent school holidays became part of the film story; everyone in the club added a little piece until an eventful and funny storyboard was completed. A background for the stage of the "Trickboxx" was then painted with watercolours on a huge sheet of paper, characters and objects were made from Plasticine. During this preparation phase the computer quite obviously was not used very often. As the "Trickboxx" arrived, everyone was excited and even setting up the box itself became an important event.

Figure 8.1.: During the filming of shots for the Trickfilm.

Because of its size and structure, children needed support from adults for its handling.

Different roles had to be taken on: besides the cameraman, assistants were needed to move characters and objects in a very precise way; lighting had to be checked on, and so on (Figure 8.1). Therefore, a good timing and cooperation between all club participants, as well as a common understanding of the whole plot was necessary. It was impossible to create the huge amount of still images needed for an animated film during one meeting. During the following meetings of the computer club all participants get very closely involved.

Four weeks later all video recordings were done, and the "Trickboxx" was sent back to the "KIKA". Now, the raw footage had to be edited to get a complete animated film. While a digital video camera was used for the capturing of the images, everything else was created and used in a "traditional", "analogue" way. The post-processing though was done completely digital. Dialogs were recorded, transferred and edited with the computer. One father in the club composed and recorded a score for the animation film at his own recording studio. Using video editing software to unite all these single pieces turned out to be a complicated process – too complicated mostly but not only for the children. One of the tutors took over this part and finished the film, advised by the participants. So, even without the knowledge about using special software for video editing, all the children and adults were able to participate until the final completion of the film.

As a result, a story was told that was negotiated between all participants during the whole making of the film. The film itself was sent to the TV channel "KIKA" and was broadcasted some months later. All participants joined for this very special moment. Children as well as adult club participants were proud to watch a film live on TV that was based on their own story and made by them themselves. And story lasted even longer: one piece of the scenery was granted a second life – the painted background used during the making of the film became a poster at the club's room in the school.

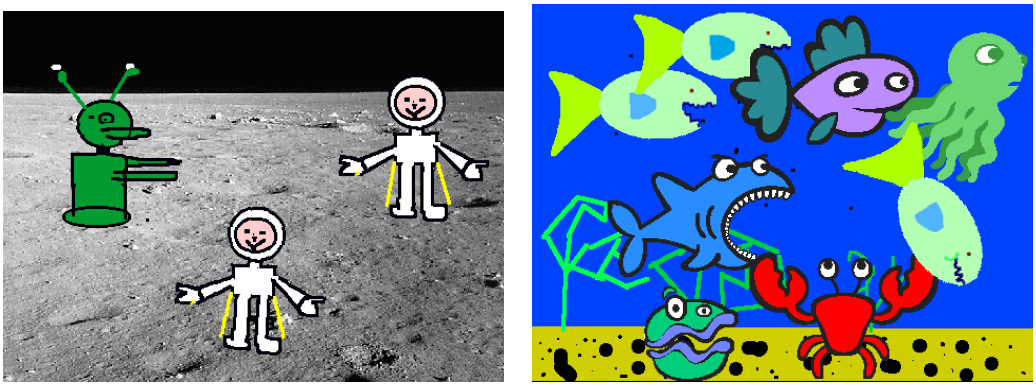

Figure 8.2.: Ideas for the film were collected in Scratch.

8.6.2. Creation of a Trickfilm in Dortmund

The idea to the project developed as one of the first activities of the newly founded computer club in Dortmund Nordstadt. A stable group of five to seven women and seven to twelve children had developed during the first projects in the club: the women had explored a PC's constituent parts, completely tearing a computer apart and bringing it back together again as "their" computer in the club with the help of a tutor; the children had gathered first experiences in the creation of little animated stories in Scratch. This children's activity led to the development of a storyboard that was then used by the group to apply for a film set with wooden box as the "stage", digital camera, and laptop that the German children's channel "KIKA" lends for film projects.

In the club's joint discussion round, it was decided – mainly as a reaction to the children's engagement – that a film would be made. A topic was easily decided upon – with school holidays just being finished, participants quickly agreed that their film story would be a travel story. Since children had just acquainted themselves with the use of MITs visual programming environment Scratch, it was a natural next step to everyone to collect and develop ideas for the storyboard using Scratch.

So, two separate activities developed in the club at first: the women were eager to take possession of their newly built and self-installed computer by exploring it, while the children developed ideas for the film storyboard in Scratch. Some could be observed referring to personal (family) background, e.g., when designing an episode at a swimming pool (*"This is just like it looks in Turkey – that's where my family comes from, so we go there for visits, you know!"*), or when choosing black, brown, green and purple for painting a beach episode and dancing ballerinas – the colors of Ghana's flag. Others decidedly engaged in designing something other than everyday life – astronauts exploring the moon and being chased by aliens, or a wild underwater world with various colorful fish and other underwater species (Figure 8.2).

In the children's minds it was not all too difficult to bring these differing ideas together

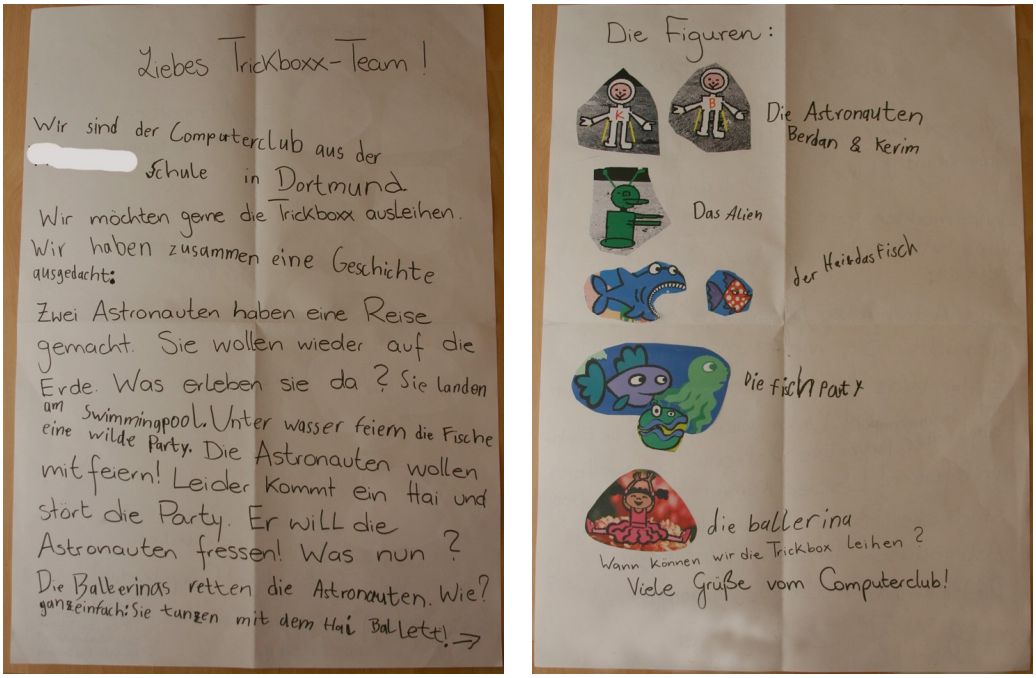

Figure 8.3.: In a letter with the storyboard idea, the computer club applied for the film set.

and built them into one joint storyboard in Scratch. (*"We make the alien chase the astronauts away from the moon, so they fly all the way to the swimming pool."* In the pool the astronauts discovered a party of fish and underwater species, and almost got eaten by a shark – if it was not for a bunch of dancing ballerinas who saved them in the end.) This story was "told" a second time – this time with pen and paper, when the children wrote their application for the "KIKA" film set with the help of a tutor (Figure 8.3).

Separate club activities grew back together into one by the time the "KIKA"'s film set arrived after school holidays some weeks later. Adults as well as children were interested in the technology, to find out how film making works and what it is that makes pictures "move". Backgrounds for the various scenes of the story had to be created and the characters cut out of paper, and this was done quickly in a collaborative effort of children and adults – obviously motivated by the perspective of starting the "real work" on the project with digital camera and computer.

Only a small number of persons were able to work with the camera and wooden "stage" box at a time, so it was agreed upon in the club's opening round that children would take turns, so that everyone would film the episode that he or she had previously imagined and created in Scratch. Children were very aware of their authorship, and carefully paid attention that no other participant in the club would take over "their" task and film the respective episode with camera and laptop (*"I did the astronaut – so I will do the*

filming where it flies to the moon, ok?!"). Children strongly identified with "their" film characters and episodes and made sure their reproduction in film would resemble the Scratch storyboard in the closest possible way. Again and again, the storyboard was replayed during club sessions to look for little details: Are the astronauts escaping from the alien to the left or to the right? Is the purple fish swimming straight or in circles? What dance movements do the ballerinas perform?

In the course of this strive for perfection the children playfully discovered the advantages and limitations of the different technologies for the realisation of their narrative: a movement that requires no more than the connection of two of programmable bricks in Scratch might demand half an hour of intensive film work – and a sequence that was easily performed with the camera could not be done in Scratch by the children alone for they did not yet fully grasp the underlying programming logic.

A strong sense for authorship could also be observed in each club session's closing round, where the children insisted that all participants would gather and watch the film work that had been completed that day (*"Mom! Pay attention – it is movie time now!"*). The women watched the growth of the film with great interest and aided the children when needed. Their more active part came towards the end of the project, when sound to the film was recorded and synchronised with the pictures – a time-consuming editing work the eight- to nine-year old children still lacked patience to do.

What came to life in the end is a three-minute film that closely resembles the story that had already been told in Scratch before – a fact that none of the children or adult participants ever complained about over the course of the entire project. Children and adults identified with the story, it was part of "their" club and its members – every episode related to the people who created it (a fact that became most visible when one of the children did not return to the club after school's holidays for the actual filming work, because she and her family had emigrated – "her" episode was not just taken possession of by someone else or skipped completely, but instead children kept referring to her when filming it "on her behalf").

8.7. Comparative discussion

In our comparative look at the development of a film project that was conducted in two different intercultural computer clubs we focus on the two levels of integration, as laid out in the introductory part: the structural and the social.

- *School setting:* To the children and adult members of the intercultural neighbourhood, the school is common ground – club related interactions do not have to start anew but instead can build on already existing structures and relations. Thus, the school itself becomes an infrastructure with resources that can be used also by the computer club. Besides the facilities other things like materials for handicrafts can be shared and used.

In the two film projects, we see this come into play as an underlying yet important factor, easing each of the project works by enabling its participants to focus on its elements and technology. Club participants could delve into the telling of their film story not being "distracted" by an unfamiliar place. Classrooms and similar facilities are made for the use by larger groups of children. Children are already familiar with them – it's "their" everyday life, where their parents must be introduced – yet another trigger for the development and exchange of stories, this time on an intergenerational level.

- *Intergenerational participation:* Since the joint participation of children and their parents, or other adult family members or friends is decidedly aimed at, the clubs' work may serve as a starting point for familiar narratives that find their continuation in individual family and friendship contexts. Children get the chance to experience their parents as learners; parents or other family members on the other hand have the opportunity to engage in and learn about computer and technology related activities of their children that otherwise remain frequently alien to them. This was a strong factor in the case of the club in Dortmund: children as well as parents enjoyed telling and thus sharing their own learning experiences (*"Mom! Pay attention – it is movie time now!"*), and even transport them into family contexts – just like one of the boys who used his own photo camera at home to create an animated film telling about life in his neighbourhood on his own, using his "Lego" bricks and characters for the setting. The complex production of an animated film needs both: ideas and creativity to tell a story – a definite strong point on the side of the children – as well as patience and technical skills, mainly contributed to project works in the club by its adult participants.

- *Collaborative projects:* Children can develop a sense for the structuring of joint activity and their own share in it – e.g., by providing help to other, less advanced club participants, with a skill that they themselves already have acquired. Our comparative project work analysis shows this to be important: children in Siegen and Dortmund willingly shared their newly acquired skills, e.g. in the use of Scratch or the handling of the camera, with others in the club. Here, the complexity of film production again comes into play. Without helping each other and dividing the needed steps into smaller tasks done by different participants in such a limited time (e.g. only four club sessions could be used for the video shots itself in Siegen as well as in Dortmund), the film would not be finished.

- *Technology:* Computer and media technology is the means to realise project work in the computer club, so it does contribute to narrative structure in the club only indirectly by supporting and triggering interactions among participants – e.g., the sharing of created artefacts.

  In the two exemplarily discussed projects we see this factor play out in different ways. In Siegen most of the preparation was done without the computer, since tools like Scratch were not available at this time. But during video and audio recording followed by post-processing all participants realised the power of the computer:

frames could be rearranged and sound was added. Only some weeks after the film was finished new software for the creation of animated films was discovered and used to a large extend. In Dortmund, the children explored and tried out different technologies, using first Scratch and then the digital video camera of the "Trickboxx" for the realisation of their narrative. Thus, they playfully learned about each of the technology's advantages and limitations.

- *Discussion rounds:* As the opening and closing point of each club session, these rounds are the place for all participants to gather and jointly plan current and prospective activities. Here, the children can develop a sense for processes of negotiation of opinions, compromise and decisions. They develop their skills in voicing their ideas, and in listening to others doing the same. Discussion rounds in Dortmund were the place, where a strong sense of authorship became most obvious: children and adults identified with the story they made up and created – first in Scratch, then on paper, and finally as an animated film. Since the children got to film the elements of the film that they created in Scratch before, every episode of the film finally related to the people in the club who created it. In Siegen the discussion rounds were mostly a place to gather ideas and jointly plan upcoming activities. Not only, but mostly for the children this becomes an opportunity to express their ideas and opinions and to negotiate with other participants about collaborative activities like the production of the animated film. Our comparative look at the two projects showed this to require a great deal of discipline from all participants in order to make the voices of adults and the more impatient children equally get heard.
- *Treasure box of ideas:* This wooden box that is kept by some of the clubs constitutes the starting point for narrative activity – in form of colourful paper cards where participants write down suggestions for further project work, e.g., the creation of a film or animations in Scratch. In our project analysis, we find this element to be of importance only for the club in Dortmund. Since the club was relatively newly established and many participants only just got to know each other, the treasure box served as a helpful starting point for project work, because participants could easily learn about the ideas of others. Not one detail of the come_IN setting alone can be made responsible for the successful development or failure of collaborative project work. It is their interplay that triggers and aids the social and structural learning processes needed to support integration on the local level of a neighbourhood community. Along the lines of Bruner (1991), and Mitchell (1981), we see processes of storytelling unfold over the course of a project's work that foster the development of individual skills (e.g., voicing ideas and opinions, listening to others, plan work, technology use), as well as social ties – among adults and children, among neighbours, who jointly engage in the project work.

8.8. Conclusion

Embedded in the decidedly open learning setting of come_IN, modern information and computer technology is capable of reaching out to integrations' structural and social dimension. In our analysis we focused on the structural elements in the come_IN clubs' activities, discussing how they may or may not unfold their learning effects with regard to integration. Our detailed and comparative analysis of an exemplary project about the creation of an animated film reveals some of the structural elements and necessary conditions for narration-based learning processes. Within in the informal club setting of come_IN these are the school setting, intergenerational participation, collaborative projects, technology, discussion rounds and a treasure box of ideas.

We observed how narratives constitute an important framework in this informal learning setting. As seen in the two film projects in Siegen and Dortmund, where children and adults in the club jointly discussed, developed and then realised the idea for a story, they can provide a structure to hold on to for the exchange of different ideas and perspectives among all participants. Especially, on the side of the children this can result in a twofold learning effect: it encompasses the opportunity to gain in eloquence – with regard to speech and the confident development and negotiation of opinions and perspectives across ages and cultures, as well as with regard to technology appropriation and use. And it holds good for children and adults in equal measure: they get the chance to perceive each other in an otherwise rather unusual way – children as (technology) "experts" and on the familiar grounds of "their" school, adults as "learners", with regard to technology use as well as a part of their kid's world and interests.

8.9. Acknowledgments

We want to thank all participants from the different neighbourhoods who are helping us to implement our research approach. Funding for this research project is provided by the German Ministry of Education and Research (BMBF).

9. Sewing Interest in E-Textiles: Analyzing Making from a Gendered Perspective

9.1. Abstract

In this paper we explore the appropriateness of e-textiles for teaching programming to mixed gender groups ages 8-12, allowing children to construct maker identities around technology. Our findings demonstrate the potential of e-textiles to promote girls' and boys' computational literacy, and the required craft and programming skills for making that can disrupt binary gender roles. We argue it allows both girls and boys to demonstrate technical mastery as well as to explore and construct a spectrum of gendered sociotechnical identities that might otherwise be obscured by conventional masculinist attitudes towards technology.

9.2. Introduction

Computing is increasingly blurring boundaries between the physical and digital realms. New forms of prototyping and manufacturing, combined with the culture of the maker movement, present new possibilities for teaching through the use of tangible artifacts. Tangibles reflect the values of the maker movement through an insistence that interactions between users and technological artifacts always have a social component (Tanenbaum et al., 2013, p. 2603). Here we explore children's motivation to use e-textiles, including the microprocessor LilyPad (Buechley et al., 2008). We examine 8-12 year old children's making and programming in three project interventions. We use gender as an analytical category to better understand how children create maker identities through their collaborative engagement with tangibles. We propose that the children we studied were able to construct their maker identities through interactions with e-textiles.

Tanenbaum et al. (2013) assert, "Maker cultures challenge traditional conceptions of the technology user. The dominant paradigm of user-as-consumer gives way to alternative framings of the user as creative appropriator, hacker, tinkerer, artist, and even co-designer or co-engineer" (Tanenbaum et al., 2013, p. 2609). In other words, this creative appropriation creates an environment that supports technological innovation, and as maker culture generates communities and collectives of practice (Tanenbaum et al.,

2013; Wang and Kaye, 2011). These collaborative interactions lead "to viral reproduction of ideas and creations where mutation, not replication, is the normal expectation" (Silver, 2009, p. 244). Maker culture promotes creative interactions with technology, as well as collaborative agendas between makers. These agendas generate both communities of practice and playful engagements with one another, and artifacts that in turn support newly discovered contexts of use.

Prior research shows maker culture supports varied and diverse identities (Tanenbaum et al., 2013); furthermore, gender is an integral part of this diversity (Leduc-Mills et al., 2013; Qiu et al., 2013; Rode, 2011). Butler asserts that traditional gender identities that rely on stereotypically masculine and feminine characteristics do not sufficiently or realistically represent the spectrum of individuals' gendered identities; these conventional gender categories are referred to as binary gender (Butler, 1990). Maker culture reveals the potential, through collaborative and playful interactions with technological artifacts, for individuals to construct a multitude of sociotechnical gendered identities.

As prior studies of e-textiles have not focused on gender identity (Buechley et al., 2008; Buechley and Eisenberg, 2008), we sought to explore how e-textiles allowed for boys and girls to express and construct their own gender identities. This social constructivist view was manifested in the children's interactions with the "democratizing" (Tanenbaum et al., 2013) of technical skills both in programming and with hand tools.

This paper's contribution is to present a study we base upon grounded theory, which demonstrates that e-textiles promote children's computational literacy, while at the same time allowing them to construct flexible gender identities as makers. Our research supports the idea that mixed gender samples potentially promote a rich and varied spectrum of feminine sociotechnical identities that might otherwise remain hidden due to a lack of gender diversity. We use these findings to argue e-textiles have potential to encourage women's interest in IT, while at the same time not forcing them into conventional gender roles that favor masculine identities and obscure feminine ones.

9.3. Related Works

Previous research supports the idea that children can develop their cognitive skills more fully within environments that support interactions with physical computational artifacts (Fails et al., 2005). This in turn supports children's ability to cultivate independent creative decisions as makers (Kafai et al., 2011, 2010, p. 217) within the context of play and collaboration (Ching et al., 2000, p. 73) (Xie et al., 2008, p. 192). While tangibles, e-textiles, computing education and cultural as well as gender diversity have been explored independently or in combination, this research is novel in how it examines them together and relates them to the culture of the maker movement that also relies on these core principles (Tanenbaum et al., 2013, p. 2604). Next we examine each area independently and consider them in combination.

9.3.1. Gender, Culture and the Formation of Identity

Research has acknowledged youth to be the first time in a lifespan, where values, beliefs and goals are developed to form a person's identity (Archer, 1989; Erikson, 1994). Identity is not seen as a fix entity but recent scientific discourse rather describes it as a structure of several co-existing or overlapping elements in lifelong constant flow (Bhabha, 1994).

Gender as well as culture, are recognized as elements that are socially constructed and shaped by self-attributions as well as in constant negotiation with others (Barth, 1998; Edwards and Jones, 2009). Over time, scientific discourse has shifted from a binary "either/or" perspective to a more diverse multifaceted view. With regard to cultural identity, Berry et al. emphasize the hybrid ascription to more than one cultural group to have a stabilizing effect on identity (Berry et al., 2006). We used the work of Judith Butler to situate our research within feminist theory. She argues against traditional binary gender roles[1] and that all individuals should be allowed to define their own gender identities without the restriction of the rigid categories of male and female, since gender categories do not emerge from biological sex, but rather are socially constructed (Butler, 1990, p. 17).

9.3.2. The Feminist Motivation for this Work

Our use of LilyPad allowed us to examine both the girls' and boys' technical mastery of programming, as well as, hand tools (Bix, 2009) in terms of their gendered sociotechnical identities. While we wanted to discourage binary gender, the symbolic gendering of technology (when technology is associated with masculinity or femininity) does occur (Rode, 2011; Harding, 1986, p. 52). Traditionally in the West, technology is associated with masculinity (Ortner, 1972, p. 14), making the LilyPad exciting it is symbolically gendered as feminine. These mappings of gender to traits are culturally constructed and change over time. For instance, the Victorians associated pink, not blue, with masculinity. Similarly, Strathern building on Ortner engages in defamiliarization to map the Hagen people's gender traits to biological gender (Strathern, 1980). In line with Western conventions concerning gender that masculinity is associated with the wild and hunting, and femininity is associated with the domestic sphere and gardening. However, the similarity to Western convention ends here. Underlying Hagen society are broad constructs of Mbo (domestic) and Rϕmi (wild), which both have masculine and feminine aspects, such that it is the feminine associated with the individual and personal ends, whereas the masculine is related to the social and clan needs (Strathern, 1980).

[1] Binary gender assumes social gender must follow biology, a practice also referred to as heteronormativity. Butler (1990) instead proposes that conventional gender roles in modern society obscure the spectrum of gendered identities that individuals can constructfor themselves. Note that because male and female are more familiar to our participants than non-binary gender we have to use them as a reference point for our data, despite our intention to construct non-binary gender theory.

Not only does the Hagen case illustrate how values attributed to masculine and feminine are different from the West, it illustrates how social constructs such as Mbo and Rϕmi frame these cultural associations (Strathern, 1980). Gender is constructed in response to the importance placed on social values (Rode, 2011). Similarly, Cockburn (Cockburn, 1983, p. 17) and Wajcman (Wajcman, 2010, p. 144), have argued we symbolically gender technology as masculine such that technology becomes "masculine culture"; this has been credited to create a sense of "gender inauthenticity" for women (Faulkner, 2000; Rode, 2011) where it is difficult for one to be both feminine and technical. If the masculine sphere in the Hagen world can be constructed as both wild and social, surely we can construct a world where technology can be feminine?

9.3.3. The Culture of the Maker Movement

We use this feminist lens to explore the maker movement. Maker culture as a movement in popular culture centers on "playfulness that includes cultural and material engagement, decisions around tool use, the leveraging of industrial infrastructures around materials and standards, and the crucial role of knowledge sharing and building new literacies" (Tanenbaum et al., 2013, p. 2604). Individual creativity (Kafai et al., 2013, 2011), collaboration (Xie et al., 2008), and problem solving (Lewis, 2009) are other important elements. As core elements all these define a movement that otherwise has been recognized as multi-faceted, as it unites designers, crafters, steampunks, and hobbyists in their do-it-yourself approach to technology (Tanenbaum et al., 2013, p. 2604) which share common maker identity features (Wang and Kaye, 2011). Research has identified them to be concerned with identity production, skill development and refinement, (Tanenbaum et al., 2013), participation principles and sharing norms (Tanenbaum et al., 2013; Wang and Kaye, 2011), and gender is of course a key component of identity (Archer, 1989; Erikson, 1994).

Collaboration is an integral component of the "playfulness" (Tanenbaum et al., 2013, p. 2604) that comprises maker culture, and peer interactions within communities of practice (Tanenbaum et al., 2013; Wang and Kaye, 2011) create opportunities for young people to construct their own individualized sociotechnical identities. This conclusion is supported by the work of Kayler et al., who discovered that "collaboration clearly impacted students in a variety of ways as they co-created and supported one another's project ideas/development" (Kayler et al., 2013, p. 1184). Furthermore, Lewis identifies technology education in the classroom to be the place where creativity is fostered, as children are introduced to the world of problem solving and invention (Lewis, 2009). Gross and Li-Yuen Do identify creativity as another locus of identity construction and the development of skill innovation, since we encourage designers to transcend boundaries between fields and to explore by constructing interactions in material, software and hardware, in a process that creates, in Seymour Papert's phrase, "objects to think with" (Gross and Do, 2009, p. 211). Maker culture supports innovations that allow users to become designers, which permit them to generate new interactions with technological artifacts.

9.3.4. Tangibles in Education

Tangibles are not only objects to learn with, but also they support "discovery learning" (Fails et al., 2005) in which collaborative processes promote children's cognitive developments, which in turn are triggered through their interactions with tangibles as boundary objects during games. We propose that computational artifacts like e-textiles allow children to "make meaning" through construction of reflexive actions during play with peers. As tangibles allow users to "make meaning" with peers, our work builds upon previous research into tangibles that reveals opportunities for users to become designers. Creativity is integral to these interactions with tangibles: it "entails creative decisions about materials and experiences that extend beyond the theories and techniques of screen-based digital interface design" (Gross et al., 2013, p. 282). With children, tangibles promote alternate ways of knowing (Weinberg et al., 2000, p. 284) and methods of problem solving (Orth et al., 1998).

Furthermore, tangibles promote learning for children in the areas of abstract learning and spatial reasoning. Tangibles offer space control by direct action and direct interaction with objects. Tangibles create opportunities where epistemic actions can take place; in other words, children can alter the steps they take to complete tasks. This supports the development of cognitive skills (Antle, 2007). Mental models and visualizations created by children interacting with tangibles allow them to imagine alternate ways of completing tasks, by creating ways in which they might directly alter their surroundings (e.g. making tasks easier to complete). Children can learn to manipulate their mappings (perceptual, semantic and behavioral) between digital and physical environments, through play and interactions with tangibles (Andersen, 2004; Antle, 2007).

Finally, learning for children requires both "physical and mental actions" (Antle, 2007, p. 197) and tangibles create the necessary environments for children as learners, since they are "active learners embedded within social and physical environments" (Antle, 2007, p. 196). Children can also learn to differentiate between concrete and abstract representations of objects; this creates rich possibilities for children to further develop cognitive skills, and engage in epistemic actions (Andersen, 2004; Marshall, 2007). Physical computational artifacts can promote "interest, engagement and understanding" (Fails et al., 2005, p. 54) in children. Kafai et al. evaluated e-textiles in a curriculum-based study, showing that they improve computational thinking in high school students (Kafai et al., 2013). Kafai's work also identified LilyPad Arduino construction kits in particular allow children to fully partake in the design process, and in turn cultivate independent creative decisions as makers (Kafai et al., 2010, p. 217). They among others have found that the extension of "embroidery to the computational realms" is especially apt to bring "girls to computers" (Kafai et al., 2010, p. 215).

9.3.5. LilyPads and Textiles

LilyPad is a set of electronic components and was developed to create dynamic and interactive garments and accessories (Buechley et al., 2008; Buechley and Eisenberg, 2008; Buechley and Hill, 2010). The set contains a LilyPad Arduino – a small programmable computer – with different sensors and actuator modules; the parts can be sewed together with conductive thread to create a circuit. LilyPad can interact with the environment by using inputs like a light sensor and using LEDs or speakers as outputs. The software application used to program the LilyPad Arduino was Arduino Integrated Development (IDE) (Arduino, 2015), which allows users to write programs to control an Arduino board.

LilyPad's creators (Buechley et al., 2008) envisioned the tool as allowing both creative experimentation and skill development in computing and electronics (Buechley and Eisenberg, 2008, p. 12). Elsewhere Buechley et al. write they hope LilyPad will contribute to democratizing the range of human expression and creativity (Buechley et al., 2008, p. 423). Buechley designed to encourage diversity specifically. Buechley et al. conducted several user studies to evaluate LilyPad in the form of six one-off workshops teaching "electronic fashion" (Buechley et al., 2008; Buechley and Eisenberg, 2008). Overall 25 of the 31 participants were female (Buechley and Eisenberg, 2008). There data suggests exposure to LilyPad encouraged participants to wish to explore e-textiles more "on their own time" (Buechley et al., 2008, p. 427). They support their data with three vignettes describing the design experiences of the three most enthusiastic students and answers to open-ended but rather leading questions such as "Do you think you might take future classes in electronics or computer science because of your experience in this class." Buechley et al. are careful to write that their results are "highly suggestive, but very preliminary" (Buechley et al., 2008, p. 427), thus while this work shows significant promise for e-textiles in education it does not firmly establish the approaches efficacy for increasing technical skill, promoting creativity, or as Buechley et al. frame it democratizing innovation for children (Buechley et al., 2008).

Qui et al. (Qiu et al., 2013) also pursue the usage of tangibles as a means to drawing children and youth of diverse backgrounds into creating technology by creating a curriculum for a diverse population in school environments to promote computer science and computer programming with the help of e-textiles. Their focus however, lies on the challenges that educators are facing when working and teaching with these materials. They created a curriculum which focused on a functional project involving creative programming. They found LilyPad impacted "builders' technological self-efficacy", and leads to "an increase in students' comfort with, enjoyment of, and interest in programming and electronics" (Qiu et al., 2013, p. 26). However, this study also had primarily female participants. Kafai's work has also evaluated LilyPad aiming to create a computer science curriculum using LilyPads with the goals of teaching creativity (Kafai et al., 2011). Our approach differs from the above studies in that it aims to explore boys and girls alike as they develop their identities as makers.

We conclude that within the realm of tangible computing, e-textiles offer a chance to critique binary gender roles insisting upon a dynamic opposition between masculine "hard skills" (seen as utility) and feminine "soft skills" (seen as aesthetics) (Wajcman, 2010). E-textiles foster the development of children's maker identities as they interact with technology in a creative, collaborative way. Our work aims to establish the legitimacy of these claims. We wish to understand which e-textile activities best allow students to construct feminine gender identities to help encourage girls in computing.

9.4. Method and Data

Our study examined three co-ed groups of children ages 8-12, doing a training activity with the LilyPad, and then an e-textile activity of an appropriate level for their group. The studies took place in our computer clubs called come_IN, which are mostly located in schools in intercultural neighborhoods in Germany (e.g. Schubert et al., 2011; Stevens et al., 2005). The clubs are openly structured and have a low barrier to entry. Our clubs had been running 4-7 years meeting weekly for 1 1/2 hours, with our study lasting about five weeks in each club.

Our mixed gender population was crucial to our study. This is because our research focuses on how we can use e-textiles to examine how children can create maker identities. These identities are collaboratively produced with their peers through gendered group interactions with tangible e-textile interfaces. We were curious how the children would construct maker identities with regard to binary gender roles. Our research supports the idea that mixed gender samples potentially promote a rich and varied spectrum of feminine technical identities that might otherwise remain hidden due to a lack of gender diversity.

Research shows exposure to technology early is critical as girls lose interest around junior high (MacDonald, 2005), thus we focused on children, ages 8-12. While Buechley et al's work (Buechley et al., 2008) had a self-selected sample of primarily girls, we wanted to work with a largely gender balanced sample to allow for a range of sociotechnical gender identities to develop; we hoped to determine if e-textiles would pique interest of those with feminine identities, while simultaneously supporting individuals with masculine identities.

The projects were chosen in consultation with the children to encourage their creativity thus supporting the development of their maker identities (Kayler et al., 2013; Tanenbaum et al., 2013). Choosing different projects also lets us consider a range of e-textile activities, which were more contextually appropriate. This was in keeping with our goal of reflexive analysis rather than statistical significance (Qiu et al., 2013). All projects were comparably complex and completed in five weeks. Our approach to the fieldwork was ethnographic in the anthropological tradition (Dourish, 2006; Qiu et al., 2013). Each of our field sites had a teacher at school that was the club's sponsor. At the conclusion of each project the research team would seek consensus with teacher and children about

the next activity. One member of our research team took responsibility for the instruction with assistance of the teacher. This was in keeping with the teacher's expectations that as researchers we would bring novel technology opportunities to the school. The other three research team members who were fluent in German took independent jottings, which later were extended to detailed fieldnotes (Lofland and Lofland, 1995) while providing assistance to children as needed. This participatory approach was in keeping with best practices in ethnography discussed by Dourish, where "ethnography's outputs are often not analytic statements purely about members' experiences, but about how members' experiences can be understood in terms of the interplay between members and the ethnographer" (Dourish, 2006, p. 543). Our participant observation allowed us to garner rapport and attempt to become cultural insiders with respect to the students to better understand their approaches to making.

Our fieldnotes were analyzed using feminist (Butler, 1990; Cockburn, 1983; Faulkner, 2000; Rode, 2011; Wajcman, 2010) grounded theory (Strauss and Corbin, 2008) by our research team, including two members who were not in the field providing a fresh perspective. Prior to our entry into the field we had read extensively and in some instances contributed theory surrounding gender both in HCIand gender studies (Rode, 2011), cross-cultural computing, critical making, as well as educational theory.

Open coding resulted in a set of 45 codes, and we engaged in open coding iteratively until new themes were exhausted. We wrote memos to engage in axial coding examining the relationship of the code categories amongst themselves and in light of theory. At this stage we explored the relationships between the aesthetics, challenges of making, collaboration, creativity, diversity, cross-cultural dynamics and gender were explored as key axial themes. Ultimately, through selective coding a key narrative about gendered making emerged. Here we build on our earlier work on the co-construction of gender and technical identity using to construct the new-grounded theory presented here (Rode, 2011).

9.4.1. Our Computer Clubs

We focus on our work with three computer clubs in Germany: A, B and C. These clubs represent a range of socio-economic and ethnic groups. Participation is free of charge, and is voluntary, though the club A represents one of a set of subject choices for the students. A teacher from each school and tutors from the research team – among them the four Siegen based authors – guided club work.

Computer Club A

Computer club A is located in a grammar school in one of the larger cities in the Rhineland area. The neighborhood includes people from about 120 countries; every second person in this neighborhood is of an immigrant background. The unemployment

rate in this area is above the city's median rate of 8%; goodly portions of those who are unemployed are also of foreign descent. Also, the average family income in this neighborhood is less than half the amount of normal family income in other parts of the city. Club A was founded in 2009. Most of the 14 children in the club have immigrant backgrounds. Many are originally from Turkey, Lebanon, Afghanistan, and Russia. Six girls and eight boys, ages 11 to 12, participated in our study.

Computer Club B

Computer club B is located in a primary school in one of the large cities in the Ruhr Area. It is based in a neighborhood that stands out in the city not only because of its high population density, large number of families, and comparatively young ages of its inhabitants, and 57.7% of the population has immigrant backgrounds. There are also high unemployment rates, low wages, and obstacles that make access to higher education difficult. Neighborhood inhabitants, a local non-profit organization and neighborhood managers brought computer club B to life in 2009. The immigrant backgrounds present in the club mirror the diversity of the surrounding neighborhood, with children and adults stemming from Turkey, Albania, Macedonia, Tunisia and Morocco. Five girls and five boys, ages 8 to 10 participated in our study.

Computer Club C

Computer club C is located in an elementary school in a mid-sized town in the Siegerland area. In 2005, 13.4% of the inhabitants of the surrounding neighborhood had immigrant backgrounds. This number has increased to about 17% in the last years. Computer club C was founded in 2006. The club participants resemble the cultural diversity of its neighborhood. Half of the club's participants were German, several were of primarily Turkish descent, and the rest were from Eastern and Southern Europe. Two boys and seven girls, ages 8-10, took part in our study.

9.4.2. Club Activities During Our Study

All three clubs were trained on e-textile basics using the same LilyPad activities. The LilyPad activity consisted of three tasks: 1) connecting an LED, making it blink in different colors and learning how to mix colors with light; 2) controlling the LED with a light sensor; 3) controlling the three different colors by use of three different means (switch, light sensor, temperature sensor). We provided source code that students edited in a limited way by changing values, or uncommenting code blocks. Students did the projects in groups of 2 to 3 children. After the training each club did an individual project. The individual projects built on the training and were equivalent in terms of task scope. They were tailored to the club's respective expertise, interests and members' ages.

(a) (b) (c)

Figure 9.1.: (a) Flexible switch, battery holder, LED and conductible thread were used for the LilyPad Freestyle activity. (b) The circuit board for the Bunny Bright project. (c) Project results from Club B.

LilyPad Freestyle: Club A Activity

After the introductory session, the children were asked to develop project ideas involving circuits and programming. Two groups emerged; one was enthusiastic about programming music with sensors and the other created figures from fabric each with a sewn-in circuit and flexible switch enabling them to light up (Figure 9.1 (a)).

Bunny Bright: Club B Activity

This electronics kit for children from the age of 5 and up is designed to teach basic electrical knowledge (Sparkfun, 2015). Following the instructions of an adult, the children soldered the LED, a reed switch, a resistor and a battery holder onto a circuit board (Figure 9.1 (b)). After completing the board, the switch could be activated by a magnet, and the LED lights up. The circuit board was sewn into a stuffed animal; in the case of our project this was a stuffed rabbit containing the board with a carrot housing the magnet. When the carrot was touched to the rabbit's mouth, its belly lit up to show it was happy. Some children elected to create alternate forms.

E-textiles with LilyPad: Club C Activity

E-textiles (also called electronic textiles) are fabrics, which have electronics and contacts sewn into them. The fabrics are still flexible by comparison with electronic components. The components were hidden in the fabric and invisible to the eye. In this project the children create a circuit with a battery holder, conductive thread and LEDs on a piece of fabric. Once the electric circuit is established and the battery inserted, the LEDs light up. In this case the LED was the eye of a fish, which lit when squeezed.

9.5. Findings

9.5.1. Introduction to LilyPad

The training session was conducted in all three clubs. Most children completed all three tasks, though a few teams in club A only finished the light sensor task as they had explored around the task instead of doing the last task. A number of issues were common to all three training tasks. A prominent feature of these activities is the children's difficulty visualizing the correct layout of components: they were trying to connect components upside down or the wrong way around, or leaving out parts completely. Yet, the children were extremely curious about the various design opportunities opening up in front of them. Many of these initial problems were seen in later activities as well.

9.5.2. LilyPad Freestyle: Club A Activity

For club A, the project was the first activity with a physical component. Earlier projects focused used Lego MineCraft to build digital worlds with blocks. As a consequence, the children initially showed great interest for this topic, especially as instead of onscreen work it allowed them to explore small programmable computers, sensors and actuator modules– components that none of the children had laid their hands on before. For the LilyPad freestyle activity the children selected their own projects and groups. Initially, the children divided in two thematic sub-groups by gender. The 8 boys chose to play music and the 6 girls sewed and stuffed animals with a soft circuit switch that turned on an LED based on a sample. At first, the boys in club A all chose to participate in the music project. Some of them refused to do needlework and drawing required for the stuffed animal project (*"I can't draw. I can't sew. I'm not going there. No way!"*). In the next session, the group became more of a mixed gender activity when some boys in the music group observed that their peers in the stuffed animal group were creating "something real", which they were allowed to keep. This influenced the boy's enthusiasm to participate. All 14 children succeeded in the overall project – but not all of them adhered to their initial thematic choices: Three boys in the music-group finalized programming the LilyPad to play a popular German children's tune ("Hänschen klein"), three boys dropped out of the music activity and joined the sewing activity late. Key issues that emerged during the project included collaboration complications.

9.5.3. Bunny Bright: Club B Activity

The Bunny Bright project that followed in club B tied well into the club's previous hands-on experience disassembling a computer. Eight out of ten children in the club decided to design an alternative to a stuffed rabbit-monkeys eating bananas, swans on lakes with water lilies, a dragonfly on a leaf, a shark that ate a rabbit, and the local soccer team's logo with a soccer ball (Figure 9.1 (c)). They all succeeded completing

the activity. Children had difficulty matching the component with its label on the board despite similar size and appropriate affordances. Also, the handling of soldering irons (Figure 9.2 (a)) and pliers turned out to be challenging for some. Finally, children placed great importance on the appearance of their designs.

9.5.4. E-textiles: Club C Activity

The idea of sewing had appealed to participants in club C: children created a circuit with a battery holder, conductive thread and LEDs laying the circuit out on a piece of fabric with an attractive shape such as a flower or animal. All children successfully completed the project. It turned out to be difficult for them to grasp the functioning of a circuit. Also spatial visualization was an issue, hindering smooth transfer of 3D wired circuits to a 2D-layout on fabric (Figure 9.2 (b)). All 9 of the children placed emphasis on the beauty of their designs, even if this obstructed practical solutions, e.g. circuit layout. Final projects included armbands with lights, and sewn images of flowers and a pig that could light up.

9.6. Discussion

Gender and making were the key analytical frames we use to examine our work; these frames were identified during our review of maker literature and feminist grounded theory. It was our goal to better understand how children create maker identities with peers through collaborative engagement with tangible interfaces. We aimed to understand how e-textiles promote alternate ways of knowing through aesthetics and utility, as makers. Finally, we examine how making allows for the breakdown of normative binary gender roles.

9.6.1. Gendered Aesthetics of Making

This first theme from our axial coding is concerned with the creative process as experienced by the children during their interactions with e-textiles and the actions they took while making projects in the clubs. *Challenges of Making, Visualizing Making, Creativity* and *Aesthetics* are the four main sub-categories. Each one is discussed in the following, as each sub-category forms an important detail of the complete picture of e-textiles as a means to challenge and possibly overcome traditional binary gender roles and allow for children to develop their maker identities: *Challenges of Making* and *Visualizing Making* as a pair encompass the conventionally viewed as more masculine "hard skills" scope of the project, the conventionally viewed as more feminine "soft skills" aspects are included in *Creativity* and *Aesthetics*.

Challenges of Making

We observed both boys and girls struggling using physical artifacts, both in terms of handling delicate components and using the tools of making. Many children – girls and boys alike – were concerned that they would break something. Dialogues like these from club B when trying to connect the LilyPad to the FTDI breakout board illustrate the issue:

> Boy 1, (looks confused) *"How in the world are these two pieces supposed to connect?"*
> Boy 2, helpless: *"Don't know. . . "*
> Boy 1, active: *"Like this? (Pauses, perplexed as the pieces don't match) No, this can't be it."*
> Boy 2, anxiously interrupting: *"Careful!!. . . "*
> Girl 1: *"What if I break it?"* Girl 2: *"It looks fragile. . . "*

Children also demonstrated lack of knowledge using tools. This was expected with new tools like soldering irons, but was also the case for how to hold pliers and in some cases manipulating scissors to cut thread. A number of the small children struggled with hand strength and the pliers being too big to for their smaller hands, and one tutor had to show children another hand position to overcome these issues. The initial unease was linked to a moment of achievement, when they did overcome the hesitancy to manipulate delicate items and use tools. As seen in the introductory session in club C when children connected LilyPad, FTDI breakout board, USB cable and computer successfully:

> Girl (with excitement): *"Ohh! There's a light flashing!"*
> Tutor: *"That means, it works and you did it right."*
> Girl, smiling confidently: *"Ok. What's next!"*

Similarly, we saw utter delight in the eyes of the Club B children when they tested their working circuit boards. It was not just the achievement to connect the different parts right, it was a moment of discovery that the technology was acting according to their will in a fashion they felt was aesthetically pleasant as well.

Over time, the initial unease gave room to exploration. As could be seen in club C, where by the end of the second task, everyone had a general understanding of the LilyPads, and teams independently approached the instructions, or came up with ideas what else might be done. Just like the two girls who wanted to experiment with delay: *"Now, could we also make it blink faster or slower? How'd we do that?"* They asked having just completed the task to have their LED change colors. When told by a tutor where to look for delay in the code, the experimented in turns to figure out the impact of large or small numbers. Thus, concern over manipulating physical artifacts presented a challenge for the development of maker identities. The children eventually overcame them. Familiarity with tools and the manipulation of objects are two challenges that future designs could further minimize in this context.

(a) (b) (c)

Figure 9.2.: Figure 2. (a) Soldering the boards in Club B. (b) Transfer of 3D circuits to a 2D-fabric layout in club B. (c) Girls took pictures of their favorite colored LEDs.

Visualizing Making

Children had trouble visualizing making with regard to 1) circuit layout, 2) making objects from fabric, and 3) relating programming code to physical real-world events.

In the training activity children in all three clubs were having a hard time visually conceiving of designs or the correct layout of components of a circuit. Older children in our 3 pilots were successful in this endeavor. So club tutors needed to repeatedly verbally explain the circuit layout and "translate" the instruction sheet to real-world actions.

> Tutor: *"Look at the table: it's + on the LilyPad. Now look in the second row: where does it go on the LED?"*
> Boy, reads: *"RGB +...* (looks at the LED, points to +) *maybe here?"*

The issue of visualization also affected fabric construction in the clubs. Many students in the initially all-girl soft circuit group in club A had trouble understanding how they might cut out different parts of the fabric to make the 3D shape; also they did not appear to have any understanding of how the insides of their figures would be constructed. They understood how the circuits and the flexible switches were made; however they did not initially grasp that the crocodile clips were just for testing and would not be included in the final projects, but rather conductive threads would replace them. The connection between programming code and physical, real-world events was also seen to be an issue. The children were having a hard time comprehending how changes they made in their codes would affect what was happening say to the 3-colored LED's blinking light, or when it came to transforming a three dimensional circuit with alligator clips to a two dimensional circuit with conductive thread.

We see the potential of e-textiles promoting alternate ways of knowing (Weinberg et al., 2000), creativity (Kafai et al., 2010) and problem solving strategies (Orth et al., 1998) in ways that transcend conventional binary gender roles. Our work builds upon previous research of Orth (Orth et al., 1998; Orth, 2001), Kafai et al. (Kafai et al., 2010), and

Weinberg et al. (Weinberg et al., 2000) by prompting both girls and boys alike to visualize circuit layouts, create the fabric constructions of their project designs, and correctly interpret written instructions for designs into real world actions. Furthermore, Lindtner has argued "contemporary maker culture is concerned not only with open Internet technology and digital things, but also with physical things such as hardware designs, sensors, and networking devices that bridge between the digital and physical world" (Lindtner, 2013, p. 1), and our work seeks to synthesize these aspects of maker culture in order to understand children's gendered identities as makers. The e-textile activity brings all these issues together for boys and girls alike in a way that supports what Tanenbaum et al. call "pleasurable, useful, and expressive engagement with technology" (Tanenbaum et al., 2013, p. 2611), thus fostering the development of maker identities across genders.

Creativity

Creativity was an issue for the boys and girls in the project with regard to 1) initial inability to find inspiration for figure designs, 2) a need for individualization, 3) self-imposed quality standards, and 4) desire to share creations.

In the process of finding ideas and inspiration for the designs of their figures, the girls in club A could be seen to employ different strategies: two girls wanted to *"look at things on the internet for a while"*; one girl looked at a biology school book, three girls scribbled sketches and discussed them until they found a shape that pleased them. Two out of three boys joined the activity late, and were copying figure designs from others in the group. So, most children did not create designs from their imaginations, but were copying shapes they had seen with peers, found in books or online, thus demonstrating the lack of creativity Kafai has seen in her work (Kafai et al., 2011) – a key skill for innovation.

A successful design was viewed as both creative and unique from their peers. This need for individual creative expression reaffirms previous research identifying e-textiles work to allow for children's cultivation of independent creative decisions as makers (Kafai et al., 2010, p. 217). This was seen in club A and club B where the children wanted to design objects other than the fish and bunny shown in the sample projects. In doing so, the children in club B displayed strong sense of ownership:

> Boy 1: *"A monkey. I'll do a monkey. With a banana."*
> Boy 2: *"No. You can't. I SAID that I wanted to do the monkey!"*

These aspects of self-imposed quality standards and authorship continued with regards to soldering boards as well. Not only did the children act as "authors" of the designs of their figures and aim to make these designs as pretty as possible, they also took care that the completed circuit boards did not get mixed up and that they got to use "their" boards that they had soldered themselves. Similarly two girls who were best friends nearly got into an argument, because their boards were laying on the table next to each other, and the girls were unable to tell their boards apart. Both thought the soldering on one board looked a little nicer than the soldering on the other one, and they both wanted to have

the possibly nicer one. These girls showed great concern even though the boards would not be visible in their projects, as they would be sewn on the inside.

Finally, creativity motivated socio-technical interactions, thus reaffirming prior findings that one benefit of an embodied public space is, where "designers take their creations into the street" (Kafai et al., 2010, p. 216): children in all clubs were excited to finish their projects and share them. Club B children were looking forward to take their stuffed animals to a slumber party at school: *"It'll be pretty with the lights shining in the dark"*, one of the girls explained to a tutor.

Aesthetics

Aesthetics were important to the children. They wanted the end product to be attractive and executed with skill. Evidence of this was seen in the introductory session in club C, where girls took out mobile phones to take pictures of LilyPads and tri-colored LED, when it blinked to the color they liked best (Figure 9.2 (b)).

> Girl 1 to Girl 2: *"Make it be blue again!"* (She takes a picture of the bright-lit blue LED.)
> Girl 2 takes LED and LilyPad: *"Now it's me – I want the pink!"*

Here, aesthetics motivated the exploration of technology through the activity of capturing the beauty. Another example occurred when children were immersed in the transfer of 3D-circuits they had created with alligator clips, to 2D-circuit layouts on fabric. All had been given two LEDs, a battery holder and a switch, to create a light-up picture with them on fabric. *"Threads can't cross or else you will short your circuit"*, is what tutors had impressed upon them – and children had trouble adhering to this. There were aesthetic reasons as well as lack of understanding for this. Two girls did not want to make use of a solution they found as they considered it to be *"ugly"*, not conform to their notion of beauty. Like prior work (Buechley and Eisenberg, 2008; Harding, 1986) they wanted the conductive thread traces to be part of their designs, in this case the shapes of a flower and a pig.

> Girl 1, to a tutor: *"I could go like this. But it's ugly!"*
> Girl 2: *"Same here! I don't want this in my picture."*

Similarly, in club B if children could not achieve do the task up to their own standards they would ask for help of someone more skilled. One boy was repeatedly being asked to draw shapes for animals, as he had a reputation in being good at drawing. Two girls asked tutors to cut out shapes from fabric. (Girl: *"If I do this, it won't be pretty."*) These scenes showed high bar for aesthetics, but also demonstrated discomfort with basic hand tools.

E-textiles project work proved to be apt to challenge binary gender roles linking ("hard skills") crafting cutwork to ("soft skills") aesthetic creation. The project required both

skill sets placing equal value on each, thus it creates a potential space for the expression of a range of feminine gendered maker identities from boys and girls. Also, it was fostering what Tanenbaum et al. (2013) and Wang and Kaye (2011) describe to be a key element of maker identities: the development and management of one's own reputation as a skilled maker person, interacting and collaborating with others. This allowed children to garner respect for femininely and masculinely gendered skills alike, further challenging binary gender.

Gendered Group Interactions

Continuing our study of collaboratively constructed socio-technical maker identities; we noted a second theme of group interactions related to Price's notion of "collaborative discovery" (Price et al., 2003). The team's motivations to create were fueled by competition between peers and a desire to learn. Here the cross-cultural nature of our clubs became relevant, and we felt the strong Middle Eastern gender roles came into play with some of our children in Clubs A and B.

This likely contributed to teams working in same-sexed groups. Among single-sex teams in clubs A and B, girls' teams were also seen to be more observant and closely following instructions, and boys' teams collaborated in a more out-going manner. With younger boys in clubs B and C, this affected the smooth completion of tasks, e.g. when two boys in club B were collaborating, simultaneously mouse-clicking and typing, thus creating random errors in their programming code in the introductory session.

When considering collaboration, we saw our findings not only confirm Price et als claim that playful learning facilitates by means of "disguising the technology so that the technology itself is not the primary focus for exploration" (Price et al., 2003, p. 171), but there is a gendered component to this type of collaboration. We observed several moments of collaboration between boys and girls. One group of girls faced a problem during the LilyPad session with the light sensor; the boy group next to them had the same problem. While not initially collaborating, they observed each other and tried to solve the problem together, eventually with a tutor's help. Another example was observed during the sewing session, while one Turkish boy refused to sew on his own making a show it was not manly, yet was comfortable chatting with girls who were scribbling model sketches on paper, commenting on their drafts, suggesting colours for the fabric. We would argue this allowed him to explore his feminine side in ways less challenging to his culture's gender norms.

The examples illustrate what Blackwell called the promotion of "positive models of experimentation and abstract description within existing domains of female competence" (Blackwell, 2006, p. 4) in e-textiles: boys and girls were drawn to the project but approached tasks differently – and mutually benefitted from this diversity across genders. Boys and girls approach tasks differently as individuals, but not in generalized ways that conform to binary gender roles. This suggests that project type and gendered nature

of collaborations are critical to learning outcomes, and exploratory research approaches crucial to understanding the varied spectrum of potential results (Rode, 2011). Like Price et al., we saw a "disguising of technology" (Price et al., 2003, p. 171), enabling girls and boys alike to be enthusiastic about the circuitry project part as well as craft skills like sewing.

9.6.2. Key Findings

In our study we inquired into how children formulate maker identities. We also observed the complexity with which girls and boys may themselves re-imagine and disrupt binary gender roles through interactions with computational artifacts. Within our analytical frames of gender and maker culture, we found key issues to encompass physical aspects regarding the handling of the hardware and related tools, problems with the spatial visualization of instructions, designs or the layout of components, aesthetics getting in the way with practical solutions, and creativity.

Our study saw the children's thematic choices to be initially influenced by conventional binary gender roles. Later, in the practical context of the e-textiles project work, these choices were altered by the children's recognition that valued project work was not solely "girl's stuff" or "boy's only," but supported rich, varied maker identities within the realm of tangible computing and maker culture discussions.

9.7. Conclusion

These activities will inform future curriculum development which will be the subject of longitudinal studies to see how they motivate deeper understanding of computing. Finally, now that we have expanded our computer club program to the US we can explore cross-cultural issues in more depth.

E-textiles have potential in developing educational activities to create opportunities for boys and girls to learn skills which traditional gender roles might not otherwise allow them to do. Whereas, technical and building skills are often characterized as masculine hard skills, and craft skills and aesthetic skills are characterized as feminine (Wajcman, 2010) – and e-textiles as a hybrid of digital and physical spaces encourage children to develop the full range of skills. We argue in doing so it has two benefits. Firstly, it disrupts normative binary gender allowing for the development of feminine technical identities, masculine creative identities and everything in between. Secondly, it alleviates girls from feeling "gender inauthenticity" when engaging in technical tasks (Turkle and Papert, 1992), which has been argued to be a key barrier to the inclusion of women in computing (Cockburn, 1983; Faulkner, 2000).

We would, however, like to reframe this problem less hetronormatively, and going forward, we should discuss the inclusion of feminine gender identities in computing, as (Cockburn,

1983; Faulkner, 2000). Finally, we argue e-textiles allow children to construct and express a spectrum of gendered maker identities through their interactions with e-textiles.

9.8. Acknowledgments

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Part V.

The Computer Club, the Neighbourhood and Beyond

10. Locating Computer Clubs in Multicultural Neighborhoods: How Collaborative Project Work Fosters Integration Processes

10.1. Abstract

Located in socially and culturally diverse neighborhoods, we have built a network of intercultural computer clubs, called come_IN. These clubs offer a place to share practices among children and adults of diverse ethnical backgrounds. We show how this initiative ties into the striving for the integration of migrant communities and host society in Germany. In this paper, we analyze how collaborative project work and the use of mobile media and technologies contribute to integration processes in multicultural neighborhoods. Qualitative data gathered from interviews with club participants, participative observation in the computer clubs, as well as the analysis of artifacts created during project work provides the background needed to match local needs and peculiarities with (mobile) technologies. Based on these findings we present two approaches to add to the technological infrastructure: (1) a mesh-network extending the clubs into the neighborhood and (2) a project management tool, which supports projects and stimulates the sharing of ideas among projects.

10.2. Introduction

"Integration findet vor Ort statt" – "integration takes place locally" – has become a well known phrase in the German debate on and striving for an integration of migrant communities and societal majority. Political as well as scientific discourse has come to the conclusion: it is the local, neighborhood setting that serves as starting point for sustainable integration processes – the most basic level where conditions of joint intercultural life are discussed, negotiated, and agreed upon.

By offering a place for shared practice among children and adults, the intercultural computer clubs following the come_IN approach contribute to these local developments. Situated in primary schools in socially and culturally diverse neighborhoods, the clubs bring together people of different backgrounds and age. Once a week they voluntarily

gather in the computer club, work on joint projects, or realize individual ideas at the computer, study and play.

These situated and shared practices are apt to develop an effect on an individual as well as on a community level (Stevens et al., 2005; Veith et al., 2009): via computerbased project work the club participants can establish new social contacts, learn about the ideas of children and of adults, respectively – within their own and from different cultures. Thus, they can actively develop a new understanding of the neighborhood and their own share in it – an understanding that may be seen as a crucial step towards integration.

Seeking out the relation of localization and place, (computer) technology use, and integration processes, we structure our analysis and argument as follows. We first give an overview on the discourse on and strive for integration of migrant communities and societal majority in Germany. Then we describe the line of research on mobile communications technology, its use, and influence on awareness for localization and place. We then describe the concept and development of intercultural computer clubs come_IN in Germany. The subsequent analysis of project work in the computer clubs is subdivided: we first give a detailed description and analysis of two exemplary computer club projects. Following and motivated by this study of two project works from the clubs, we show in the in-depth description and discussion of two technological interventions, how each of them is apt and intended to support the club participants' meaningful and persisting shared interactions and work. This discussion of social interaction and local neighborhood peculiarities is then closely linked to the description and analysis of two technological interventions from two computer clubs. This close combination finally points to the chances and limitations of collaborative project work in come_IN with regard to integration processes.

10.3. Related Works

The come_IN approach roots in and contributes to two different fields of research – separate, yet related by their spatiality. We are laying them out in sequence here, thus bringing out the gap that come_IN is answering to.

10.3.1. Integration discourse and initiatives

Awareness for the significance of localization and place has become one of the two major lines of discussion in the political and scientific discourse on integration in Germany: under the headword of "Parallelgesellschaften", "parallel societies", the German public discussed about neighborhoods in large cities where migrant communities live with few or no contact to society's majority (Esser, 1996; Straßburger et al., 1997; Bommes and Krüger-Potratz, 2008). Some see these neighborhoods as a proof for decades of failed societal integration policy, and others do approve them to some extent as a place to preserve cultural traditions and language, thus serving as a bridge between cultures.

Spatial is the second line of the integration discourse as well – in a way that it is concerned with matters of equal access to all parts of societal life, such as justice, governmental institutions, education, labor, standard of living, and social security. Under the headword of the "digital divide", the unequal access of migrant communities and mainstream society to computer infrastructure has made up for a considerable amount of this discourse (e.g. Wagner et al., 2002; Hinkelbein, 2004).

These two lines of the debate hint to the underlying understanding of integration. Integration, so it appears in scientific discourse (Berry, 1984, 1992; Schuck and Münz, 1998), has a structural dimension that is – matter-of-factly – concerned with equal access to all parts of societal life. Secondly, it has a cultural dimension, dealing with a common basis for living. The elements of this basis, such as common language, core values, common rules, and mutual respect for and knowledge of social and cultural differences, are often discussed with great emotion.

Intercultural computer clubs come_IN contribute to the German strive for the integration of migrant communities and societal majority. They serve to establish and strengthen social relationships in the intercultural neighborhoods by enabling and supporting collaborative practices among the young and adult members of the neighborhoods' mainstream and migrant societal groups. Also, the computer clubs contribute to the bridging of the "digital divide" by providing open access to modern information and computer technology. With this approach, the US concept and tradition of computer clubhouses (Resnick and Rusk, 1996b; Rusk et al., 2009) has been developed further, addressing the integration ofmigrant communities as well as issues of inter-generational learning in culturally diverse contexts. Following principles of situated, collaborative learning, and constructionist thinking, these US computer clubhouses have opened up many new opportunities for disadvantaged inner city youth (Michalchik et al., 2008) in the US and around the world. Their structure and success is well documented in research (e.g. Kafai et al., 2009). Where the US approach has a strong focus on the strengthening of individual skills and thus opportunities, the come_IN concept concentrates on community dynamics and the strengthening of social ties – on the local family, school, and neighborhood level.

10.3.2. Technology mediated interactions

Creating the setting for meaningful and persisting shared interactions among local neighborhood residents by means of (mobile) technology use, the come_IN computer clubs contribute to a line of research focusing on technology mediated interactions (e.g. Gurstein, 2000; Huysman and Wulf, 2004; Norris, 2003; Steinmüller, 2004). Here, social collaboration of individuals by means of communication devices make up for one focus of scientific attention (e.g. Foth et al., 2006; Gaver, 1992; Höök et al., 2002; Mynatt et al., 1997; Naukkarinen et al., 2009; Paulos and Goodman, 2004; Syrjänen and Kuutti, 2004). What are the necessary pre-requisites that enable and support these shared activities and interactions? Other researchers concentrate on the technologies themselves, asking how these influence and cause forms of behavior, such as patterns of mobile phone use or

the interrelation of virtual teamwork and real-world collaboration (e.g. Chapman, 2006; Qiu et al., 2009; Rheingold, 2002), or looking at the development of new (locative) media applications and projects (e.g. Harle and Hopper, 2005; Løvlie, 2009). The latter approach and look into types of interactions via realization.

Yet another focus of research lies on the development of mesh-networks. Due its recentness most of the research is focusing on the technical aspects of establishing wireless community networks (e.g. Flickenger, 2003; Aichele, 2007; Leung and Hossain, 2007). Most of the "notes from the field" came from the USA or the developing world (Gurstein, 2008). Social aspects like effects and opportunities related to the use of wireless mesh-networks are in the second place and mostly much less considered (e.g. Flickenger, 2007). Another field of research regards typical issues within a wireless mesh-network like fair use and sharing bandwidth, mostly more technic- and less usercentered (e.g. Wu et al., 2006; Martignon et al., 2009).

Fundamental to both of these scientific foci is their spatiality: human perception of everyday life and of interaction with others is essentially influenced by the surrounding space and place. One does behave differently, depending on where one is, and who is company in this respective place. The use of (mobile) technology is apt to shift and broaden perspectives here, e.g. by overcoming physical limitations and boundaries. At this point, the come_IN approach links the insight that integration processes may best be supported by the strengthening of social ties on the very basic local family, school, and neighborhood level to the scientific expertise how these local interactions may best be fostered and mediated by (mobile) technology.

10.4. come_IN computer clubs

Primary schools are purposely chosen to give home to the come_IN computer clubs: in intercultural neighborhoods they are the place to inevitably meet for people of different backgrounds (e.g. economical, educational, and migration). A basic rule for the computer clubs' weekly two-hour meetings is that children should participate together with a parent. This rule was changed after a while – children who could not join the club together with a parent (because parents had to work during club time) were encouraged to join come_IN together with another adult family member or friend. Project work in the club is conjointly decided upon.

The first come_IN club exists in Bonn Nordstadt since March 2004. Guided by school teachers and students from the come_IN team who work as tutors in the club, brochures about the neighborhood have been created; shared experiences like a travel to Berlin or a soccer match with a neighboring Turkish soccer club resulted in photo and video-projects, animations, and games designed with the help of MIT's visual programming software Scratch (e.g. Maloney et al., 2004). In Siegen Wellersberg, the transferability of the concept was tested in 2006 with the establishment of a second come_IN computer club. There, the experience from Bonn has been used to refine (a) social and (b) technical

aspects of the concept by (a) establishing an opening and a final short discussion round, where all club members gather and talk about current and prospective activities, and (b) allow a more flexible way of playing and working by retrofitting the club-equipment of stationary PCs with mobile laptops, and at the same time structuring the clubs file repository with personalized logins.

Four new clubs have been founded in summer 2009: (a) a school complex in Bonn–Tannenbusch with primary school, secondary modern school, and grammar school on one site brings together children, teenager, and their respective parents in two clubs, (b) a neighborhood initiative in the Nordstadt of Dortmund established a club in a primary school, and (c) senior citizens in Kreuztal adapted the come_IN concept for their idea of a computer project with teenagers in a youth center.

10.5. Methods of Research

Principles of participatory action research (McTaggart and Kemmis, 1988) guide the accompanying come_IN research project: information on collaboration and interaction, appropriation to media and computer technology, learning and social integration is gathered from narrative interviews, group discussions, audio and video material. This qualitative social research is combined with active or observing participation in the clubs.

This paper's description and analysis of collaborative project work in the clubs builds up on data gathered from field notes that have been taken by tutors during the weekly club sessions, interviews with club participants, photo and video material. The interview data provided here is part of a set of data where we aimed at issues of integration, asking for (a) the motivation to participate, duration of participation, previous IT knowledge and experience, learning experiences in the club on the structural level, and (b) cultural/migration backgrounds, the community experience, friendships, and favorite projects on the cultural level. Our coding of the interviews (Lofland and Lofland, 1995; Strauss and Corbin, 2004) was guided by the two dimensions that have been shaped in scientific discourse on integration – the structural and the cultural level (e.g. Berry, 1984, 1992; Schuck and Münz, 1998). An overview on the respective empirical material used is given in each of the two presented studies of project work and technological interventions in the clubs.

10.6. Collaborative project work in come_IN

Project work in come_IN is closely linked to the various neighborhoods. Within these manageable local limits, the respective needs and peculiarities most immediately become visible and can be met and dealt with by an openly structured initiative like come_IN. Our in-depth description and analysis of two computer club projects from Bonn Nordstadt and Dortmund Nordstadt exemplarily illustrate this. Primarily contributing to the cultural dimension of integration is a project of "neighborhood-stories" from Bonn,

triggering the exchange of different opinions and perspectives on assumedly known neighborhood places among young and adult club participants by joint exploration of these in photographs and writing. Meeting mainly the structural part of integration needs in the intercultural neighborhood is a "computer puzzle" project from Dortmund, where women in the club chose a very palpable approach towards the computer, exploring its various components with screwdriver and soldering iron, and finally putting together two computers that accessibly remained as "theirs" in the computer club.

10.6.1. Neighborhood-stories

The idea to the "neighborhood-stories" in Bonn Nordstadt roots in the observation that the club members' joint exploration of places in the neighborhood, followed by the processing of these experiences by means of the computer in the club, is apt to mobilize learning capacities that otherwise remained frequently unused. In the intercultural neighborhood, where 27.8% of the population does have a migration background (compared to the city of Bonn with 22.4% migrant population), the largest share of which is of Turkish descent. In teams, children, and parents in the computer club decided on places and topics they jointly wanted to explore in their neighborhood: places of like and of dislike, special people, or the histories of their houses. They captured their neighborhood impressions in photographs and writing. Back in the computer club these images and texts were then assembled to little brochures. And in the end, computer club participants did not keep their impressions and neighborhood perspectives to themselves but proudly introduced them into the neighborhood by selling their "neighborhood-stories" for a little money during school events or in places like local book stores.

Our discussion of the impact of the "neighborhood-stories" project is based on qualitative data that we gathered from six semi-structured interviews with club participants from Bonn Nordstadt, as well as from the project artifacts themselves – the "neighborhood-stories". An overview on the number of children and adults participating in the creation of four issues of these little magazines reveals an average of 30 participants for each of the issues of "neighborhood-stories". With regard to cultural background the participation in the "neighborhood-stories" is mirroring the general neighborhood structure, Turkish and German children making up for the largest share of the project participants.

The four discussed magazine issues contain:

- polls (2),
- interviews with neighborhood inhabitants (9),
- stories on neighborhood life and history (11),
- fictional stories (12),
- histories on places and houses (21),
- club project reports (45).

What most stands out here is the observation that the actors' mobility outside the club's room has a considerable share in the story-related collaborative learning processes. Children and adults jointly decided on places they wanted to explore, wrote about special events in neighborhood life such as a Turkish wedding, interviewed special people like the vendor in a local kiosk, or reported on club-related neighborhood events like the soccer tournament with a neighboring Turkish soccer club.

The mobility aspect was also emphasized in the interviews by the club participants themselves. A girl from the club phrases it like this: *"We went out into the neighborhood to explore places, and then we came back to the computer to put down what we saw with our own pictures and writing. This was fun."* A teacher emphasizes the educational aspect in this undertaking: *"For me, there was an educational aspect to it, to improve especially the migrant children's reading and writing skills (...). When they came to the club they wrote their little texts, or maybe only underlines to pictures they had taken."* And a father as well as the teacher then describes how this collaborative processing of neighborhood experiences by means of the computer puts computer club members of different age and culture in an equal position as learners: *"All of a sudden, we had this dialog (...)"* One artifact example for this dialog is a story that a little Muslim girl wrote about her personal "place of dislike" in the neighborhood. It was a gallery's shop with various pieces of abstract art being scratched on the shop window – among those an abstract painting of a naked female body, which the little girl experienced as undue on her daily walk to school. Not only did her story trigger dialog about what's appropriate among members in the club, it also led to a talk and exchange of opinions with the owner of the gallery.

The owner, being informed by one of the school teachers tutoring the computer club, expressed her considerable surprise about such a perception of her show window. However, she declined removing the painting from her show window by referring to the freedom of artistic expression. While in this case intercultural dialog did not lead to easy consensus, the various members of the neighborhood became aware of the diversity of its values and their implications for daily life.

We see the learning processes encompassed by the project to be three-dimensional. They cover (1) the technical aspect of mastering different (mobile) media, such as photo cameras and the computer with its writing and image editing software, (2) the educational aspect of mastering common language reading and writing skills, and (3) the social aspect of becoming acquainted with different views and opinions on assumedly common things in the neighborhood.

10.6.2. Computer puzzle

In Dortmund Nordstadt, the computer club came to life in summer 2009 in a neighborhood that does stand out in the city not only because of its high population density, large number of families, and comparatively young age structure, but also because of its rich

diversity of nationalities, cultures, and religions (57.7% of the neighborhood population does have a migration background), high unemployment rate, low incomes, and difficult access to higher education. Neighborhood inhabitants were not reluctant to voice their interests and needs when the idea to the computer club was first introduced in local discussion rounds and neighborhood initiatives. Computer literacy was seen as important pre-requisite for access to various parts of public life and the proposed computer club expected to provide good help with regard to that matter.

Thus, the club decided to take a very palpable approach to the computer, exploring its constituent parts with screwdriver, pliers, and soldering iron as one of its first activities. Development and progress of this project have been documented in its 20 club sessions that took place over the course of six months in weekly field notes, video material of two club sessions, and photo material. This data constitutes the basis for this analysis. First, a quantitative look at the field note data reveals: participation in the "computer puzzle" project is constant – and it has a migration background and is mostly female. On average five women took part in the project, four of which have a migration background, coming from Turkey, Macedonia and India – a quota that mirrors the neighborhood diversity.

It is the women in the club who show greatest interest in the project (Figure 10.1). One of them explains, why: *"At home that is a man's thing."* Another woman adds: *"I can do many things – but not computer. We do have a computer at home. But I have three boys – so how can I ever use it?"* Two fathers show interest in the computer club over the course of the project, each of them joining one club session – and neither one committing himself to further participation after observing the women's engaged "computer puzzle" work. One of them explains: *"Uhm, maybe this is better for my wife to come here next week."* With great curiosity and respect, the women in the club approach the technology, completely taking each computer apart and taking a detailed look at its various components. From the accompanying tutor they seek answers and advice to basic questions: What is main storage – and why does a computer need it? How does a computer "think"? What is the difference between various operating systems? What programs does it really need? Why does "stand-by" not equal "turned-off"?

At first glance this very detailed approach may seem disproportionate in a setting where no computer experts are being educated but basic computer literacy for everyday use is demanded. The qualitative look at the field notes taken over the course of the project reveals: it is this in-depth quality of the "computer puzzle" project that accounts for its persistency. This does not mean that every one of the women was able to explain and handle every single aspect explained independently, once the "computer puzzle" had been completed: By taking down the computer to its very bits and pieces, the women – most of whom did not have (regular) access to computers before (*"At home that is a man's thing."*) – lost their respect for the technology, simultaneously gaining confidence in exploring, trying, and erring things independently. Where at first they voiced hesitation before approaching a task (*"Are you sure, I can do this? Won't I break it?"*), they confidently ventured to achieve things on their own (*"Let's go, we can handle this. After all we managed to put this entire computer together before!"*). When the "computer puzzle"

Figure 10.1.: Each of the computers' various components was closely looked at and explained.

project was finished, the two computers remained as the "adult computers" in the club, not being used by the children during club sessions but reserved and used for undertakings of the adult club participants.

10.6.3. Discussion I

A comparative look at the two exemplarily discussed computer club projects points to one important aspect in the effort for the fostering of meaningful and persisting shared interactions in the intercultural neighborhood. Both projects strongly indicate that for people's joint appropriation of the socially and culturally diverse neighborhood it is important to consider both, structural matters of access to technology and social matters of negotiating different perspectives, sharing opinions and finding a common basis. While the former can be identified as the main aspect of the "computer puzzle" project of the women in Dortmund, the latter is in the focus of the "neighborhood-stories" in Bonn, where the little brochures turned out to be starting point for dialog and exchange of perspectives among the various members of the neighborhood. The social structure of the computer club with its joint discussion rounds where help is provided and different perspectives are being negotiated provides the setting needed in order to transform free and open access to technology into a persisting and (locally) meaningful use of (computer) technology.

10.7. (Mobile) technology for local neighborhood communities

This insight motivates the come_IN approach not to take (computer) technology as the starting point of inquiry but to approach and further develop it from and for its respective

appliance in people's local daily practices. The following two undertakings may serve as an example for this. There is, (1) the establishment of a neighborhood-based mesh-network in Siegen Wellersberg, intended to support the closer linking of club activity and neighborhood life, and (2) the creation of a project management tool for the clubs' work, supporting the handling of large amounts of data as well as a sustainable sharing of the expertise gained over the course of one project's work for later times.

10.7.1. Extending the club: a neighborhood-based meshnetwork

The success of the collaborative approach during the creation of the "neighborhood-stories" using different (mobile) media becomes one of the reasons for the undertaking of establishing a neighborhood-based mesh-network. A wireless network should increase the mobile usage of devices like cameras, recorders or laptop computers in general. For the second club founded in Siegen Wellersberg, this increased mobility and flexibility of the used hard- and software was very important right from the start in 2006. Due to the very limited spatial possibilities at the beginning, the club had to be as independent of a particular room in the school as possible. Even after the clubroom had been finished in 2008, this independence was advantageous. Laptops are used frequently – the club owns only three stationary computers that are more computationally efficient and are, therefore, used for relatively complicated and time consuming activities, e.g. the production of videos. The computers are connected via a normal local area network, a fast wireless local area network (WLAN) is used for the wireless connection of the laptops. A server provides several basic services, an internet connection and the participants' user accounts.

Accounts and data of the participants are not only stored centrally, they are also mobile. Thus members are independent of the local school network, and can work from outside the school as well. When they get back to the club, the data is synchronized automatically. In addition to the computers mobile devices like digital cameras are used for taking pictures and making recordings that are processed further in the club. By now, participants can use all the offered services and possibilities in the school and the surrounding area. Not only the laptops are connected, also first attempts have been made to transfer pictures wirelessly as well.

In order to further develop structures of technical mobility and independency in the club, a mesh-network that is located in the surrounding neighborhood is being established at the moment (Schubert, 2009). Mesh-networks are organized in a decentralized way, and are therefore different from normal networks. Every participant is represented by a network node and contributes to the creation of a mesh-network, in which everybody takes part in the exchange of data. When a network node disappears, the other members can work without being disturbed noticeably. This is due to the automatic reorganization of the network and the routing of data via alternative ways (Dobusch and Forsterleitner, 2007; Gurstein, 2008).

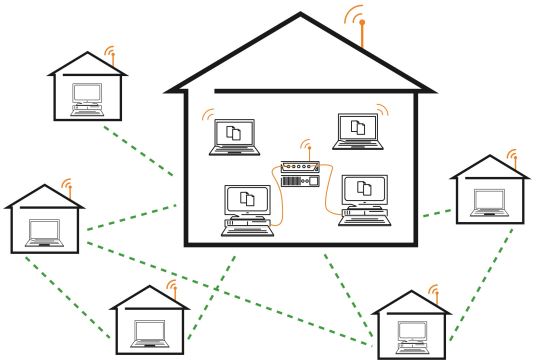


Figure 10.2.: Mesh routers interconnect the participants' houses and apartments.

With the active help of the club's participants this mesh-network may connect the participants themselves as well as different clubs. It is planned to install mesh routers as first nodes of the network in the participants' houses and apartments (Figure 10.2). Club participants will be familiarized with the devices and thus will be able to take care of their maintenance by themselves after a while.

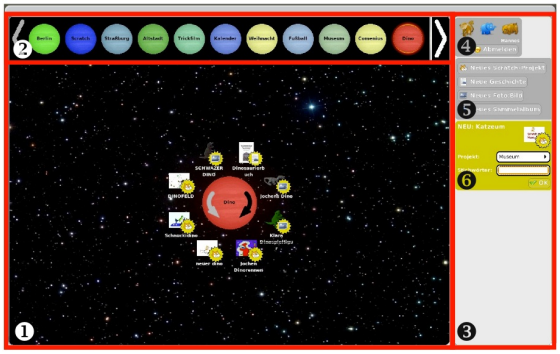
To optimize the reliability and coverage of the mesh-network, the installation of additional network nodes on roofs, poles, or other suitable places is being considered at the moment. It is meant to provide possibilities for direct and indirect communication as well as the exchange of project data. The use of a wireless mesh-network may be seen as a technical realization of the club's social structure. Starting in the school, the network is meant to "grow into" the neighborhood and shall provide interested persons with the opportunity to gather information about the club and maybe even participate in it.

In a summary there are several reasons for a neighborhood-based mesh-network. It supports a closer connection between participants due to direct communication and easier data transfer. Participants can meet longer or more frequently for activities outside of the normal opening hours. The network better supports activities outside the club's rooms, e.g. by the use of location-based services. It might be used as a contact and information platform. There's an opportunity of active and direct participation of the members while constructing and increasing the network. The "self-organization" of a wireless mesh-network can be used for its own growth and development; it offers a high availability and stability and is relatively cheap with regard to acquisition and maintenance and is independent of commercial providers. Last but not least the possibility of a cheap or even free broadband internet connection could be another important reason for the participation in the club, and could support the overcoming of the digital divide (more than 50% of the participants do not yet have a broadband internet connection at home).

10.7.2. Finding and sharing materials: Splatch2 – a project management tool

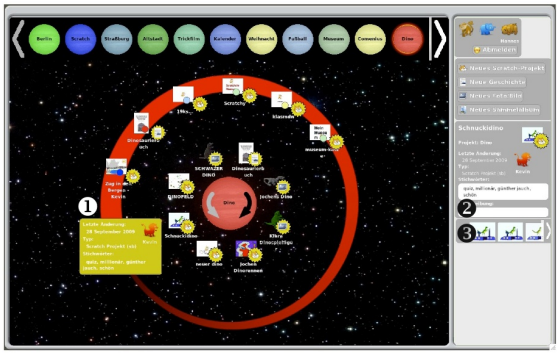
It was observed in several – especially larger – computer club projects that the artifacts created by the participants often remained incomplete and needed intensive tutoring during their process of creation. This was mainly found to be attributed to an overwhelming amount of data produced during the activities (e.g. photos, videos, and written stories) as well as a shared file access provided by the network operating system. Its complexity could not be handled by most of the participants, specifically by the elementary school children. In the end of a section, the children often stored raw materials and work-in-progress at places in the directory structure, which they could not find even in the next meeting a week later. Participants lacked an overview of the materials available they could use to process their experiences, and some of the skills needed to transform them to personally meaningful artifacts (Korn and Veith, 2009). Hence, a project management tool called Splatch2 is being developed, which supports the participants in their everyday project work and in multiple projects over time. The tool helps them on an individual level by displaying relevant artifacts in their current context (e.g. raw materials or previously created or incomplete artifacts) and also embedding them in the network of other related artifacts. It encourages re-use of own and the artifacts of others. On a collaborative level the tool visualizes expertise by highlighting the authors of or contributors to specific artifacts and recommends experts in specific fields to actually collaborate in the colocated club settings. In the long term Splatch2 is supposed to establish a pool of generated ideas and accumulated expertise from within the club.

During a pre-study three club sessions were recorded on video and interviews with younger club participants were conducted. Field notes and memorandums were also taken. All this material has been gathered, transcribed, and analyzed to spot first requirements and to develop a preliminary, non-functional prototype. Subsequently, this prototype is being further developed according to the empirical findings of a continuing evaluation in an evolutionary and participatory software development process. Screenshots are showing the user interface of the main window. In Figure 10.3, area 1 shows the interface metaphor of FileUniverse: a club project is represented by a planet at the center of the screen, surrounded by files related to this specific project shown as satellites. Area 2 is a navigation bar, where the user can switch between different projects. The bar on the right hand side (area 3) is used to display different widgets, like the LoggedInUserWidget (4) or one for the creation of new artifacts (5). Awareness about other club participant's activities may rise by another widget announcing their new created and related artifacts (6). This widget may trigger and support sharing of artifacts or joint work. In the second screenshot (see Figure 10.4) the planet FileUniverse is surrounded by even more satellites – these are recommended artifacts from other projects with similar characteristics to the one in the middle. Each artifact in this orbit has a visiting card (1) containing meta-data about itself, shown also by a MetaDataWidget (2). As another example a VersionsBowserWidget is also shown in the widget bar on the right (3). Both widgets are addressing the trouble of handling the overwhelming



❶ FileUniverse
❷ Navigationsleiste
❸ Widgetleiste
❹ LoggedInUserWidget
❺ Anlegen neuer Artefakte
❻ Benachrichtigung über neue Artefakte

Figure 10.3.: In the FileUniverse artifacts are displayed related to their original projects.



❶ Visitenkarte und Umlaufbahn
❷ MetadatenWidget
❸ VersionsBrowserWidget

Figure 10.4.: Related artifacts from other projects are displayed as satellites.

amount of data produced during club activities. Meta-data facilitate tasks like search or arrangement of artifacts, a version-browser allows an easier access and management of different versions of the same project.

In comparison to the currently most influential and commonly used desktop metaphor as graphical user interface for computers our tool relates to greater extend on spatial representations and metaphors. It is not only that a more adequate metaphor is being developed – Splatch2 implements the transition from single artifact construction kits towards complete environments for self-directed project management.

10.7.3. Discussion II

The two above described examples – the neighborhood based mesh-network and the project management tool Splatch2 – are closely related to the specifics and needs as had previously been identified during project work in the clubs. Both technological interven-

tions are being developed in order to support club participant's local daily practice in the neighborhood. The use and support of the wireless mesh-network may be seen as a technical realization of the club's social structure, where participants interact and engage in discussion and exchange of perspectives (in the club as well as in the surrounding neighborhood) as could be seen in the project example of the "neighborhood-stories". Every club participant may use the mesh-network, and in doing so the mesh-net prospers, grows in range and thus becomes even more useful for all.

The project management tool Splatch2 does not only support the handling of digital artifacts created by the club's participants. It also allows the re-use and sharing of artifacts and expertise at the same time, employing an underlying algorithm for search and cluster analysis instead of providing the user with special search functionalities or the like. Thus it can function as technical support for the individual appropriation of basic computer skills for everyday use – project work like the above discussed "computer puzzle" strongly indicate the importance not only of technology's accessibility but of its embedding in a social context providing the necessary confidence for its exploration and usage.

Concluding, it can be said that both above described and discussed undertakings show how structural matters of access to technology can be tackled and improved locally. Also, social matters of negotiation and interchange of perspectives and opinions in the intercultural neighborhood can be supported by the use of services or tools like a mesh-network or Splatch2. Because of Splatch2's clientserver architecture it could also be used via a network like the internet or the neighborhood-based mesh-network.

10.8. Conclusion

So, what does collaborative project work in come_IN computer clubs contribute to integration processes – and under which conditions does this happen? The closely linked look at local interactions and technology use indicates a twofold strength of the concept. On the one hand, its open structure is apt to trigger collaborative activity in the intercultural neighborhood by addressing people of different backgrounds and age without reserve. It does not come along as a course where certain pre-requisites are needed for participation and a predefined set of topics are addressed, but promotes itself as a place for the joint exploration of the intercultural neighborhood space, as seen in the "neighborhood-stories" – and the acquirement of skills in (mobile) technology use and language skills as a consequence of this endeavor. Thus, the club may contribute to processes of exchange and negotiation of perspectives and opinions in the neighborhood. These activities may well be seen as important steps towards integration, because they contribute to its cultural dimension – the negotiation of the terms for a common basis for living.

On the other hand, the club's free and open structure does not imply a lack of guidance – as seen in the "computer puzzle" project, where help and guidance is provided to the women when exploring the computer's constituent parts. This guidance ensures the

persistence of technology acquirement as well as social interactions by reducing inhibitions and reluctance among the young and adult club participants. Thus it can be seen as further confirmation of insights that the initiators of the US computer clubhouses have summed up under the title: "Access is not enough" (Resnick and Rusk, 1996a). With this guided yet free and openly structured access to technology and to the acquirement of skills needed for its use, the come_IN concept serves to the structural dimension of integration, concerned with equal access to all parts of societal life – where access to (computer) technology sure has an important share in modern life.

And by extending and transferring the observed social negotiations of perspectives and matters of guidance to matters of technology development and design – as exemplarily seen and discussed above in the two technological interventions following from project work in the clubs, come_IN computer clubs are even apt to closely match local needs and peculiarities with technology. This is an important step to ensure its persisting and meaningful use, and thus a contribution to the bridging of what Hinkelbein (2004) and Wagner et al. (2002) have discussed as a "digital divide".

Next steps in the creation of the mesh-network and the use of the project management tool Splatch2 will help to further strengthen and develop this come_IN approach that is in line with Naukkarinen et al. (2009). Instead of taking technologies as the starting point of inquiry and activity, come_IN computer clubs are focusing on distinct (neighborhood) communities and their location and media related practices. The current focus on the local neighborhood level in the German debate on and striving for the integration of migrant communities and societal majority (e.g. Bommes and Krüger-Potratz, 2008) proves this concept to be sensible. It applies and unfolds its effects on the most basic level of integration: the local neighborhood – home to those who shape and participate in the process.

10.9. Acknowledgements

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11. "Hey Can We Make That Please?" – Upon Craft as a Means for Cross-cultural Community-Building

11.1. Abstract

Focusing on computer clubs in Germany, this paper studies varied craft-based interventions as facilitators not only for the appropriation of computing concepts, but for engaging young and adult neighborhood inhabitants in activities that enable cross-cultural and technological identity exploration. We show how craft as a method for engaging participants in reflective, collaborative activity is apt to trigger and support community-building in socially and culturally diverse societal contexts.

11.2. Introduction

From the arts and craft movement (Dormer, 1997) to today's DIY making (Tanenbaum et al., 2013), from theoretical thinking about the significance of craft in relation to the making of art (Whittick, 1984) and everyday design artifacts (Bean and Rosner, 2012), a focus on crafting as innovation (Yair et al., 2001), and crafting as remodeling and repairing (Tinari, 2010): crafting and the creation of things has been in the focus of researchers for many years, spanning multiple disciplines. This includes the CHI and CSCW community, where the relation of computing and craft has come to the fore in recent years (e.g. Buechley et al., 2009; Mellis et al., 2013). Two lines of discourse have evolved. The first is concerned with craft and its significance for the development of the individual (e.g. Bardzell et al., 2012; Treadaway, 2009). Here, special attention is paid to the creative moment involved (Do and Gross, 2007). The second line of research approaches the concept of craft from a decidedly interdisciplinary point of view, seeking to fundamentally explore and understand its influence on design in HCI (e.g. Wright et al., 2005). Where these works have a special focus on crafting as a type of activity, as well as its influence for informing design practice, we seek to explore the potential of craft for community-building processes. Our study is based in a network of computer clubs in socially and culturally diverse neighborhoods in Germany. Providing open yet guided access to modern information- and computer technology in an after school setting for children and adults, these clubs seek to contribute to the bridging of

the so called "digital divide" – the unequal access of immigrant communities, as compared to mainstream society, to computer infrastructure (e.g. Norris, 2001; Wagner et al., 2002; Witte and Mannon, 2010). With this, the computer clubs aim to foster cross-cultural understanding and respect in the diverse local neighborhood setting (Schubert et al., 2011; Stevens et al., 2005). In our comparative study of three craft-based interventions we seek to understand, how craft can be employed as a means to trigger and foster cross-cultural and technological identity exploration, and with this foster community-building in socially and culturally diverse societal contexts.

11.3. Related Works

We explore how craft is an appropriate educational method for generating boundary crossing effects, and a means not only for the appropriation of computing concepts but also for the supporting and fostering of community-building in a socially and culturally diverse setting. In the following, we establish our research approach and study setup by first discussing previous works in the area of crafting and making, before we then relate key aspects to previous works on identity development and community building.

11.3.1. The Concept of Craft

On a very basic level, craft has been described as "any process that attempts to create a functional artifact without separating design from manufacture" (Löwgren, 2007, p. 200). With this, craft as a method is apt to interlink the physical and the digital (Wroblewski, 1991); previous research has described it to be a skill for manipulating materials into physical objects (Bardzell et al., 2012; Bean and Rosner, 2012; Rosner and Bean, 2009; Torrey et al., 2009).

Creativity has been identified as a key component of the concept (Bardzell et al., 2012; Do and Gross, 2007). Bardzell and colleagues describe it as a "pleasurable form of interaction, connected in meaningful ways to self-expression, livelihoods and leisure, creativity and innovation, heritage, and sustainability." (Bardzell et al., 2012, p. 11). Focusing on the relation of digital practices and "traditional", physical handworks, manual work has been identified as a factor that is adding value to the artifact created – even more so than any potentially valuable material involved (Rosner and Bean, 2009; Rosner, 2010). We are following this notion, understanding craft as an act of making and creating an artifact, which in itself speaks to meaningful aspects of identity and everyday life.

11.3.2. Computing and Craft Production

The relation between computing and craft production has increasingly come to the fore in CHI and CSCW research in recent years (e.g. Buechley et al., 2009; Mellis et al.,

2013), and the three cases we present here can be seen as an example. Building up on the insight that crafting has the potential to link the digital and the physical, there are leisurely constructions of creative, craft-based endeavors (e.g. Rosner, 2010; Zoran, 2013). Other works rely on craft as a cognitive method for sense-making, e.g. through play (e.g. Do and Gross, 2007; Kuznetsov and Paulos, 2010). Ratto has taken this one step further, coining the term of "critical making" for an activity that emphasizes "the shared acts of making rather than the evocative object". What stands out here is the collaborative: achieving "value through the act of shared construction, joint conversation, and reflection" (Ratto, 2011, p. 253).

11.3.3. Crafting and the Building of Identity

Identity building processes are seen to be deeply rooted in learning activities. Race, culture and gender have been described as three main factors that shape identity, and their negotiation is a constantly ongoing process Bhabha (1994). Hybrid ascriptions to more than one group are possible in the process. This is valid with regard to the shaping of cultural identity (Barth, 1998; Berry, 1992), as well as gender identity (Butler, 1990) – where at first, a binary perspective was prevalent in scientific research it has now shifted towards a multifaceted view. Craft-based project work supports this in that it relies on crafting as a cognitive method for individual sense-making. It allows for "meaningful ways of self-expression" (Bardzell et al., 2012, p. 11).

11.3.4. Crafting and Community Building

Just like identity formation, the building of a community as well is a process that is in constant flow and strongly dependent upon the negotiations among the different constituent groups. Different specifications of adaptation mark the progress: integration, accommodation, separation, and marginalization. The attitude towards the own identity as well as the intensity of one's relation to other groups are seen as important factors for the progress (e.g. Berry, 1984). Crafting ties in to these process in that it speaks to forms of individual expression. At the same time, it allows for collaborative, reflective shared construction – for "critical making" (Ratto, 2011).

11.4. Methods

11.4.1. Methodological Setup

In our study of craft-based interventions as facilitators of cross-cultural and technological identity exploration, we followed a participatory action research approach, combining social science research methods and the regular participation with dis-privileged or marginalized groups (McIntyre, 2008; Whyte, 1991). Qualitative methods were used

in all our three case studies, and we relied on field notes and collected transcripts as part of the participatory action research (PAR) setup (McTaggart and Kemmis, 1988). The young and adult computer club participants are engaged in the PAR process in regular interviews and feedback sessions, providing feedback on completed project work and upcoming project activities, as well as the overall organization and structure of the computer club. Field notes as the main data resource for the work presented here are supplemented by interviews and the artifacts created over the course of the three projects in focus.

11.4.2. Data Collection and Analysis

The members of our research team are actively engaged in the computer club in the focus of this study, where they routinely act as tutors and have done so since its inception. It is this computer club, where the activities that we describe and analyze took place. The field notes have been taken during the club's weekly sessions and have afterwards been documented in the form of detailed minutes. In their focus are the observable collaborations and interactions of children and adult participants in the club, their appropriation of media and computer technology in combination with various craft-based activities, and the associated processes of community building. Data analysis (Mayring, 2000; Krippendorff, 2012) was conducted by the authors who were active as tutors in the computer club. Our content analysis was led by the study focus on craft as a means to foster community-building in a socially and culturally diverse neighborhood setting. To prevent bias, our research team has established a routine of weekly meetings, where all tutors from all clubs assemble to report and discuss the progress of the project activities in the different computer clubs that are part of the network.

11.4.3. Computer Club Setting

The computer club at the center of this study is located in a primary school in one of the large cities in the Ruhr Area in Germany. The computer club was founded by a group of neighborhood residents, a local non-profit organization and neighborhood managers in 2009. The surrounding neighborhood stands out in the city because of its high population density, large number of families, and the comparatively young ages of its inhabitants. Almost 58% of the population has immigrant backgrounds. Unemployment rates in the area are high, wages are low; access to higher education is often difficult.

This computer club is part of a network of computer clubs in socially and culturally diverse neighborhoods in various cities in Germany. Contributing to the bridging of the so called "digital divide" – the unequal access of immigrant communities, as compared to mainstream society, to computer infrastructure (e.g. Norris, 2001; Wagner et al., 2002; Witte and Mannon, 2010) – the clubs provide an open yet guided access to modern information and computer technology for children and adults. With this approach the come_IN computer clubs build up on the original US initiative of computer club-

houses (Resnick, 1996). Relying on principles of situated, collaborative learning and constructionist thinking, these computer clubhouses explicitly address inner city youth with educationally and socially deprived backgrounds. They aim to open chances for disadvantaged local communities in the cities. Their success is well documented in research (Resnick et al., 1998; Michalchik et al., 2008; Kafai et al., 2009; Center for Technology in Learning, 2013). Based on this concept, the come_IN clubs aim to foster community dynamics and strengthen social ties – on the local family, school and neighborhood level (Weibert and Wulf, 2010). Furthermore, collaborative project work in the club contributes to the development of individual skills and thus opportunities (Weibert et al., 2014).

The come_IN structure reflects the computer club aim: (Primary) schools in intercultural neighborhoods in Germany have been chosen as the clubs' location. Being a locus for interaction between people of different backgrounds (e.g. economical, educational, migration), the school as the clubs' location can be assumed to be a starting point for social interactions that do not have to start anew but can build on shared experiences. Within this location, the computer clubs aim to be everything else but school: Appropriation of computer technology in the computer club results from constant negotiation among its young and adult participants – tutors and teacher in an equal position among them. The club provides the opportunity to get acquainted with modern technology and software – but it does not follow a pre-set schedule in doing so. Club participation is supposed to be intergenerational: children are invited to participate together with a parent or another adult family member or friend. Thus, project work in the club is intended to trigger intergenerational learning experiences that ideally continue in family and neighborhood contexts (Schubert et al., 2011).

Project work in the computer club is conjointly decided upon. The young and adult participants plan and coordinate their club's current and prospective activities in joint opening and closing discussion rounds. To ensure that the voices of children and adults would be equally heard in the process, it was decided that one child and one adult per session would team up to jointly moderate these rounds. A "treasure box of ideas", which some of the clubs keep, makes project ideas accessible for later times: children and adults collect their project plans and ideas for activities on paper cards that are kept in a wooden box. The neighborhood influences project topics (e.g. Schubert et al., 2011; Stevens et al., 2005) – e.g. when magazines about the neighborhood are created, shared experiences like a two-day trip to Berlin or a soccer match with a neighboring Turkish soccer club result in photo- and video-projects, or are processed by means of MIT's visual programming language Scratch (Maloney et al., 2004).

11.4.4. Project setups

All three projects in the focus of this study are rooted in neighborhood issues, problems and activities that the young and adult participants had brought into the computer club. All three projects have been jointly agreed upon by the club participants, and

have been carried out combining digital skills and traditional handcraft. Participation was completely voluntary; however, a stable group of participants developed in all three cases.

Computer puzzle

The Computer puzzle project was one of the first activities of the computer club in the focus of this study. The project developed as an answer to the very basic questions that the young and adult participants had carried into the club, and from their common understanding that computer literacy is a key skill securing access to various parts of public life. In the computer puzzle, club participants took a very palpable approach to the computer, exploring its constituent parts with screwdriver, pliers and soldering iron. The parts were thoroughly examined, and explanation on their functioning was provided by a tutor. In the end, one computer was re-assembled and installed for the mothers in the club to work with. In an activity that branched from the main computer puzzle project, some artwork was crafted using the remainders of the computer parts. Crafting in the context of this project was concerned with first the re-creation of the computer, and in a second step with the transformation of some of its constituent parts into something else, when an art sculpture was crafted from hard drives and other computer parts. The project developed in 20 club sessions over the course of six months. On average five women took part in the project, four of which have a migration background, coming from Turkey, Macedonia and India.

Safe Routes: Designing for Safety on the Way to School

The project was developed because students and their parents were concerned about the danger of a street crossing right in front of the school building, where many accidents and nearby-accidents had happened. This had caused teachers to devote extra time to the education of the children in road safety. And children had also carried the topic into the computer club, voicing their interest to turn this into a project. The outcome was threefold: 1) the club participants decided that they wanted to create a video about the dangers of the way to school; 2) children designed reflective vests by creating little animations using Scratch (Maloney et al., 2004, p. 3) children crafted these vests with paint brushes and reflective colors (Figure 11.1). The project took five weeks to complete. Ten children, two tutors and a teacher took part.

"Travelling Dragonflies" Geocaching Project

The geocaching activity developed as a craft-based activity, in that computer club participants followed the idea to relate the real-world treasure hunt of geocaching to their own lives and neighborhood by crafting little individualized objects that would then be sent as so called geocaching "trackables" on some kind of travels. Dragonflies were chosen

Figure 11.1.: Children crafted their vest designs with paint brushes and reflective colors.

as the shape of the trackables because the school, where the computer club is based, is called “Dragonfly Elementary School”.

The project developed in three subsequent steps. First, the computer club participants designed and crafted the little dragonflies from colorful beads and wire (Figure 11.2), equipped these as so called ‘trackables’ with an online identity and travel destination which was registered at a geocaching website. Secondly, these dragonfly trackables were set free in a nearby cache that the computer club participants had identified in the neighborhood. Thirdly, children and adults in the club followed the “travels” of their dragonflies on physical paper maps and online, and also had them compete in a geocaching trackable online race. Our field note data covers a time span of seven months where the project unfolded in 36 hours of club work. Seven adults and ten children (7 boys, 3 girls, ages 7-10), took part in the study. With children and adults from Turkey, Albania, Macedonia, Tunisia and Morocco, participant backgrounds mirror the diversity of the neighborhood where the club is located.

Figure 11.2.: The trackables were designed to be dragonflies.

11.5. Findings

11.5.1. Computer Puzzle

Adult and child participants alike were drawn to the activity, as they had never explored a computer from the inside. Especially the children liked the exploratory part of approaching the computer with the help of screwdrivers, pliers and soldering iron.

As the project continued, the activity shifted more and more towards the side of the adult participants: all of them were female, and they said that at home they did not have much access to the computer. *"There's my husbands, and then there are my sons...not much time left for me"*, one woman said. Another one added: *"At home that's a man's thing."* So they enjoyed the freedom to ask many questions and also to learn in a hands-on approach about the interplay of software and hardware, as well as to explore and compare different operating systems. The joint crafting activities let the women develop a stable relationship as a group: When one of them would be late for the computer club or did not show up without prior notice, the others from the group would call her and tell her to hurry up and come to the computer club (*"Where are you? It's computer club!"*). Also, they would use the crafting activity as a vehicle to discuss other issues from their everyday lives (e.g. informally and casually chat about their family lives, problems at work or caused by the loss thereof, and the progress of their children in school). Also, the women would provide help and advice among each other, e.g. by sharing experiences they had made in facing a certain problem, or in passing on contact information of instances and persons providing help and assistance in the neighborhood and beyond. That way, a stable and lively community of women emerged, who – by means of crafting and their engagement in the computer-related project work – did not only notably gain in self-confidence in the use of computer technology, but also developed friendships reaching across cultures and beyond the weekly club structure.

The project resulted in two artifacts. First, the mothers put one of the old computers back together in the end and installed it with the operating system edubuntu to keep it as "their" computer in the computer club from then on. Secondly, the mothers discovered that there is a certain beauty in the various constituent parts of a computer, and they made use of this by designing and crafting an art sculpture from hard drives and other

leftover computer parts.

11.5.2. Safe Routes: Designing for Safety on the Way to School

All crafting in this project did result from computer-supported design and programming work. Children in the club created a video about the danger of their ways to school. They used different cameras and camera angles to show their audience their point of view. With a camera attached to their head, the children recorded how they cross the street and what kind of dangers they look for. Furthermore, they virtually designed reflective vests at the computer, using drawing software as well as the visual programming environment Scratch. These designs were printed and used as template for the crafting of the real reflective vests.

In crafting, children were seen to follow a strong desire for quality and beauty. They were always concerned that their designs would be most skillfully crafted and completed – and if there was the least doubt that they themselves would be able to achieve that, they would seek help from their teacher or a tutor.

Collaboration in this project was mostly linked to aspects of creativity. Children turned towards each other and their respective craft creations when it came to developing ideas further, or when someone was short on ideas how to proceed with his project. That way, ideas that were considered cool, or a detail of a project that was considered as especially skillfully crafted, would "spread" among the children, when being copied by others and included in their creations. Besides design ideas, children also asked each other for help, if one of them was very skilled and creative in using the paintbrush and other tools, e.g. making use of the end of the paintbrush to draw very thin lines of color.

Thus, in crafting, the sense of community among the children in the computer club was strengthened: they experienced, that they were able to rely on and make use of their skills to transport a message in their neighborhood, that was meaningful to them. By collaborating as a group for the creation of this message, they added weight to it, so it would receive more attention.

11.5.3. "Travelling Dragonflies" Geocaching Project

Crafting activities in this project were concerned with the designing of the dragonflies from beads and colorful wire, which were then used as "trackables" – travelling items – in the geocaching project. Then, these designs were equipped with a travel destination. Children could be observed to link this to their own personal lives and experiences, e.g. when they chose a travel destination that related to their own family's migration background ("Go to Bosnia", one boy would write, then explaining: *"That's where my family comes from, you know?"*), or to the personal family situation – just like the boy who wanted his trackable to go to places *"where there are happy people and friends"*; because he was facing a lot of conflict at home due to his parent's recent divorce. Thus,

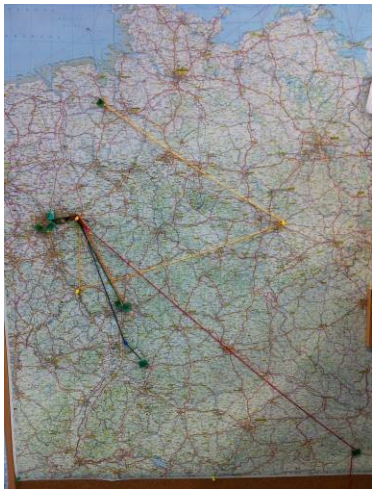


Figure 11.3.: Every week the position of the dragonfly trackables was updated and thus, the children developed an understanding of space and place and their own position within.

the geocaching project work did speak to the children's identity building in that it made them think about their own personal characteristics when they designed their dragonfly trackables and equipped them with a name, a character and a travel destination.

At the same time, the crafting element in the project activity did foster community building. All crafting took place in an atmosphere of competitive collaboration. Children were seen to help each other when needed, e.g. with the connecting of beads and wire, or in writing the travel descriptions - well aware how this providing of assistance to others would put themselves in the position of a skillful expert, and was needed to bring forward the overall project activity. Several of them teamed up to create their trackables, in these constellations they had to collaborate on the design, the attached text and travel destination. At the same time the children showed a strong desire to have their own dragonfly be the most beautiful and skillfully crafted. *"Hey, can we make that please..."*, was a commonly heard request for help, uttered with the greatest confidence that there would be someone (tutor, mother or more skilled) around in the club who was able to join in to the crafting and secure a high quality artifact as a result. And usually there was.

Once the trackables had started their "travels", crafting activity in the club was concerned with following the progress of the dragonflies on maps – online and on paper on a wall in the computer club room. There, each child would update the position of her dragonfly weekly with a photo sticker on a pin, thus developing a sense for space and place (and their own position within) in collaboratively shaping an image that put their own position and the current locations of their dragonflies in a relation to the rest of the world (Figure 11.3).

11.6. Discussion

In all three project cases, we saw the crafting part to be the element that would provide the link between lessons of computational literacy and the children and adult participants' everyday lives and experiences.

This was the case in the *computer puzzle*, where the hands-on approach to the computer provided the mothers in the computer club with an access to the topic that was not given to them in their homes. Via the crafting activity, the mothers gained in confidence in the handling of the computer hard- and software, so that in the end they even approached it in a non-utile way, crafting an art sculpture from left-over hard drives and other computer parts.

In the *Safe Routes* Project, computer club children turned an everyday problem (the dangerous street crossing in front of their school) into a craft project: the digital designing of the reflective vests made them use and expand their computing skills (using image processing software and the visual programming environment Scratch), the crafting of these vest designs with paint on the fabric of actual vests again linked these skills back to the everyday lives of the school children. And finally, in the *Travelling Dragonflies* Geocaching Project, the crafting part spoke to the participants' identity building in that it made them think about their own lives, about individual skills, origins, and wishes. In a second step, the project fostered community building processes in that it made participants think about these individual aspects in relation to the neighborhood community and their position within that community.

We saw: Crafting does appeal to actors independent of age, gender and cultural background, providing "meaningful ways of self-expression" (Bardzell et al., 2012, p. 11). Likewise, supporting the ongoing negotiation process of the factors that shape identity; race, culture and gender (Bhabha, 1994), in a "shared act of making" (Ratto, 2011) during joint project work activities. In a social learning process, not only artifacts are created collaboratively but also personal ties through "joint conversation, and reflection" (ibid., p. 253).

11.7. Conclusion

When he coined the term of "critical making", Ratto has linked to modes of engagement with the world: a reflective, critical thinking approach, and the very hands-on, physical "making, goal-based material work" (Ratto, 2011, p. 253). In our study, we have taken this concept to the socially and culturally diverse neighborhood community setting. We have shown how craft-based interventions speak to individual needs and experiences, and allow for the development of individual skills, such as computational literacy, reading and writing, as well as traditional handcraft. Building up on this, the crafting allowed for more: it let computer club participants act as experts (Tanenbaum et al., 2013, p. 2064),

provide as well as receive help and assistance when needed, develop an eye for the needs of others, discuss different perspectives, organize tasks and work – and with all of this translate everyday life experiences into "goal-based material work" (Ratto, 2011, p. 253) that is apt to foster collaboration, joint reflection, and with it support the building and strengthening of a local community.

12. Creating Environmental Awareness with Upcycling Making Activities: A Study of Children in Germany and Palestine

12.1. Abstract

This study explores the development of environmental awareness and computational literacy among children by means of upcycling making activities in Germany and Palestine. Our research supports the idea that the combi-nation of handcraft and digital work, documentation and social interaction in the upcycling can foster the develop-ment of a maker identity in children. Findings indicate that upcycling can sensitize children for environmental issues of global relevance, foster their environmental learning and encourage them in the exploration of creative answers.

12.2. Introduction

A large problem of modern society is waste production. As products are innovated in high frequency and product lifecycles are short, consumer products – be it smartphones, computers, household items or furniture – become quickly "out-of-date" and obsolete (Cooper, 2005). Product packaging further aggravates the issue. In 2014 Germany produced more than 1.7 mio. tons of e-waste (Baldé et al., 2015). With most consumer electronics being affordable and repairing being time-consuming and more expensive than replacement, societies have developed throw-away habits, not reflecting on consequences. In response to this, upcycling has become a movement, working on strategies to repurpose, repair or modify things. The DIY maker community has been "hacking" products to appropriate them for specific uses, giving old objects new meaning instead of throwing them away (e.g. (Buechley et al., 2009)). These initiatives have not (yet) reached mainstream society level (Silver, 2009). We propose that especially from the young makers' perspective, upcycling can be a means to learn about environmental resources (e.g. Seravalli, 2016). By promoting creative interactions with technologies as well as collaborative agendas between individuals engaged in making (Santulli and Langella, 2013; Vallgårda et al., 2016), an environment is generated that supports "alternative framings of the user as creative

appropriator, hacker, tinkerer, artist, and even co-designer or co-engineer" (Tanenbaum et al., 2013, p. 2609). Thus, creative ways of coping with environmental issues are fostered. A bottom up making approach can be a fruitful way to educate children with regard to environmental issues, and to empower them in the design of creative responses to these challenges. This paper's contribution is a study of computer clubs in Germany and Palestine, where upcycling is explored as a means to foster environmental awareness among young children. Our research shows how the combination of handcraft and digital work, documentation and social interaction in upcycling can foster the development of a maker identity in children. Upcycling, we argue, not only sensitizes children and fosters their environmental learning, but encourages them in the exploration of creative answers.

12.3. Related Works

Tangibles and aspects of materiality have been approached from various angles in HCI and beyond, prominently among them child learning. Our work is linking these discourses in our study of upcycling as a means to foster environmental awareness among young children.

12.3.1. Making, Recycling and Upcycling

Making is concerned with creating an object by shaping or changing materials, combining or re-arranging parts (Hatch, 2014). Blikstein and Krannich (Blikstein, 2013) focus on educational benefits introducing Maker Spaces as places that expose learners to handcraft, computation, engineering and maths. While "recycling" is a common term, "upcycling" is rather new. The Oxford Dictionary has backtraced it to the 1990s, describing it to result from the blending of the two words up- and recycling, and to be concerned with reuse of "(discarded objects or material) in a way as to create a product of higher quality or value than the original". Recycling is the process of "destroying" the original product so the material it is made of can be re-used as a resource (Terracycle, 2017). Santulli and Langella portray upcycling projects (Santulli and Langella, 2013), focusing on local waste and linking designs to local culture and habits. Ali et al. (2013) study upcycling as a sustainable approach of giving 'waste' new value without degrading the original material (Andersen, 2004).

12.3.2. Learning with Tangibles

Tangibles as objects to learn with promote cognitive development triggered through children's interactions with them, e.g. in play. Also, they support "discovery learning" (Fails et al., 2005). Building on previous research with e-textiles (Weibert et al., 2014), we propose that tangible upcycling artefacts can foster meaning-making among children engaged in their playful creation. The creative aspect immanent to this encompasses de-

cisions about materials and experiences (Gross et al., 2013, p. 282). Previous research on e-textiles has found tangibles to enable alternate ways of learning, skill building (Weinberg et al., 2000, p. 284), and problem solving (Orth et al., 1998). Tangibles support children's need to combine physical and mental activity in learning (Antle, 2007), e.g. to support literacy learning (Kleiman et al., 2013). Differentiation between concrete objects and their abstraction sophis-ticates' cognitive development and engagement in epis-temic actions (Ali et al., 2013). Physical computational artifacts can promote "interest, engagement and understanding" (Fails et al., 2005, p. 54) in children. Research in IDC has explored means to foster computational learning and programming skills in children (e.g. Chawla et al., 2013; Guo et al., 2016). Tinkering learners (Bevan et al., 2015) make use "of "just in time" resources and feedback to guide the next steps in their exploration of the problem space" (Lyons et al., 2015, p. 49).

12.3.3. Environmental Learning and ICT

Scientific discourse on environmental learning unfolds along the lines of a) teaching programming, and b) upcycling and making. Various works have set out to foster child learning about scientific phenomena like evolutionary change using computational modeling environments (e.g. Guo et al., 2016; Wagh and Wilensky, 2013). Also, researchers pursued the reverse way, linking programming concepts to phenomena from nature to introduce basic programming logic (Vallgårda et al., 2016). Björkvall and Archer (2016) studied the re-contextualization of resources in global consumption ecologies (Björkvall and Archer, 2016). Applying their insights to education, they found the design element in upcycling to be supportive to the education of global critical citizens.

12.4. Method

Our study of upcycling project work with children in computer clubs is predicated on the idea of participatory action research. This entails social science research methods and commitment to participation with dis-privileged or marginal groups (McIntyre, 2008). To achieve this in our study, qualitative methods are used, and field notes are relied on as part of the participatory action research (McTaggart and Kemmis, 1988) perspective. Field notes are the main resource for the study presented here, supplemented by the artifacts and accompanying digital multimedia stories created in the project. Members of the research team are active participants in the computer clubs where they routinely act as tutors. The clubs are where the upcycling activities took place. Field notes were taken by the tutors during the weekly sessions, and have afterwards been documented in a formal protocol. Their focus: observable collaborations and interactions of the kids, their appropriation of media and computer technology in relation to the (upcycling) project work, and associated processes of learning.

12.4.1. The Setting: Intercultural Computer Clubs

The come_IN computer clubs provide open, yet guided access to information and computer technologies and related skills for often marginalized groups in intercultural neighbourhoods. Thus, the clubs a) contribute to a bridging of the "digital divide" (Norris, 2001), and b) foster integration pro-cessses (e.g. (Schubert et al., 2011; Weibert and Wulf, 2010)). Hence, come_IN computer clubs build on the US concept of computer clubhouses (e.g. Kafai et al., 2009).

Computer Club A

This computer club is located in an elementary school of a large city in the Ruhr Area in Germany. It is based in a district with high population density, young age structure, and cultural diversity (approx. 58% of the population with immigrant background). High unemployment rates, low wages, among other obstacles, make access to higher education difficult. Immigrant backgrounds in the club mirror the district's diversity. Participants' backgrounds are from Albania, Macedonia, Morocco, Tunisia and Turkey.

Computer Club B

The computer club is located in a Palestinian refugee camp embedded in a Palestinian city (Aal et al., 2016, 2014; United Nations Relief and Work Agency, 2017; Yerousis et al., 2015). The camp was established in 1949, built on land which is leased by the UNRWA from the Hashemite Kingdom of Jordan. The camp population was deported or fled from a nowadays Israeli area, during the Arab-Israeli War in 1948. High population density (72,916/km^2) (Yerousis et al., 2015) and precarious living conditions characterize the camp (Palestinian Central Bureau of Statistics, 2017). Interactions between refugee population and the surrounding society is scarce. Due to the political and socio-economic situation, club sessions sometimes get cancelled. Israeli Defense Forces occasionally close down the camp. In winter, it might be too cold to work in the club room, which has no heating.

12.4.2. Our Project Activities

The core activity unfolded over the course of six sessions, followed by a period of collaboration and exchange about the results and related experiences and learning.

Core Activity Computer Club A

In computer club A in Germany, ten kids (5 girls/5 boys) took part in the upcycling. The project was accompanied by a teacher and two tutors, who provided guidance and

Figure 12.1.: Upcycling artefacts from Computer Club A included a jam jar snow globe (left) and a fabric doll (right).

assisted with the making tasks. Artefacts included a cardboard racing car with a balloon engine, a fabric doll, a jam jar snow globe and a plastic cup telephone (Figure 12.1). The first session introduced the topic. A tutor had created examples of upcycling artefacts (a paper Alice band, a plastic bottle car, a plastic bag purse). The children were asked to guess the commonality among these. From there, the tutors directed the group towards brainstorming on materials. The kids left the session with the task to observe their daily lives, to see what kinds of waste are produced, and what could be made of them. The second session started with the children's presentation of their observations. Waste materials were listed, and the children teamed up to work on one material of their choice. They sketched construction ideas and listed tools needed. The third session was concerned with the creation of the projects. Tutors and teacher helped with constructions and tools. Kids documented the making with digital cameras.

Children finalized the making of their artefacts in the fourth session. Then the group engaged in planning the digital upcycling stories. Kids learned about search engines in a game. Teams researched information about 'their' mate-rials and processed this information in writing, which was finalized in the fifth and sixth session. Texts and images documenting the making were assembled as stories.

Core Activity Computer Club B

6-20 kids (approx. equally f/m) age 10-14, guided by two volunteer students participated in the activity in Club B. The resulting artefact was a two-seat bench made of plastic bottles and car tires (Figure 12.2). The kids got introduced to the idea of "making something" out of waste and the issue of it being on the streets was discussed. Children were asked to bring "useful" waste to the next session, where tutors handed them protective gloves for collecting material in the neighborhood. Afterwards they reflected upon the sourced material and its' reuse potential. In the next two sessions the kids engaged in ideation and reflection by playing word games. They also sketched buildable objects before deciding to build "something to sit on".

Figure 12.2.: Club B made a bench from plastic bottles and tires.

The fifth workshop was about reflecting on the usability of a chair in general. Kids brainstormed problems with their club chairs and sketched prototypes before agreeing on a design and materials. In the last session, the chair was built.

Collaboration of Clubs

Over their upcycling artefacts, children from both computer clubs engaged in exchange and learning about living conditions and the environment. The exchange among the clubs is initialized by the tutors in club A. It starts with the children preparing a short greeting introducing their upcycling stories. Those are sent via email and the initiative triggers a video "conversation" among the clubs. The kids exchange motivations for their upcycling projects, information about themselves and their environments, their living conditions, and upcoming project ideas of their club.

12.4.3. Data Collection

Data basis for this study are field notes, images and artefacts. The researchers, who are also the authors of this paper, recorded extensive jottings as well as reflexive memos during the club activities. These were completed to full field notes right after each session.

The entire upcycling activity was documented in digital images taken by the researchers, as well as by the children themselves.

Finally, the upcycling artefacts were collected, as well as video and text messages exchanged about the upcycling and resulting artefacts among children of both clubs.

12.4.4. Data Analysis

Intercultural and environmental awareness were used as frames to examine collaboration and learning among the kids. Field notes were coded by the researchers looking for themes related to the concepts underpinning the shared acts of making and reflection. A qualitative and thematic analysis (Fereday and Muir-Cochrane, 2006) was conducted that refined our initial open codes, and revealed three main themes that we isolated, *materiality, organization of work*, and *digital literacy.*

12.5. Findings

Environmental awareness was the key analytical frame we used. Findings yielded materiality and handcraft challenges, organization of work and structural thinking, collaboration, problem solving, digital literacy and privacy as central topics.

12.5.1. Materiality

For the participants in both clubs, an exploration of materials marked the beginning of all subsequent project activity. For the children in club A, this meant engaging in observation of everyday routines: over their two-week fall vacation, the children observed what kinds of trash they produced, and where in their neighborhood they perceived waste as problematic. When these observations were then discussed, the kids linked them to ideas on what kinds of creations could possibly be created from these materials. This broad exploration refined when the children started focusing on a material's characteristics, e.g. by asking how paper needs to be bend to create a stable construction. Another example are two girls in Club A, tinkering with materials to create "snow" for a snow globe in a jam jar. Club B creatively reflected on trash in a wordplay: a piece of waste is handed from one kid to the next, each adding to its description (Boy 1: *"A green bottle."* Boy 2: *"A green bottle with a blue label."* Girl 1: *"A green bottle with a blue label and a lid."*) Thus, children got to pay attention to details, and think about (waste) material characteristics.

Handcraft challenges

In line with previous research (Weibert et al., 2014), children demonstrated a lack of knowledge using tools. This held with sophisticated tools like paper cutters, but also with commonly used tools like scissors. Tutors provided help, and encouraged the kids

to explore the specificities of each tool (Girl 1: *"How can we make a hole in a glass? Drill it?"* Tutor: *"No. Glass can only be reshaped when melted at a very high temperature."*) In tasks like cutting paper or using hot glue, the children were still developing their fine motor skills, at times struggling to realize the constructions they had drafted. Again, tutors provided guidance and support when needed.

12.5.2. Organization of Work

Organization of work unfolded along the lines of *structural thinking, collaboration* and *problem solving.*

Structural Thinking

When asked to draw their ideas, children would sketch with regard to previously sourced material. A team of girls in Club A quickly discovered that it can be useful to structure their sketch using different colors. Field notes report them to proceed in a very organized manner. First they just list materials in the order they come to their minds. But then one girl suggested to make a drawing of the envisioned artefact and to label the parts with the materials they would later be made of. Girl: *"Yes – and we use different colors. Then we can see, what materials I can bring, and which ones you will bring."* The sketch, which looks like a simple drawing, is a construction plan highlighting assigned tasks.

Collaboration

From previous activities, children in both clubs were used to team up and help each other. Field notes report how girls and boys alike routinely look around in search of a peer who could help them, or are happy to provide help, when they see that this is needed. Especially the construction part of the upcycling is prompting collaboration. The kids enjoy discussing different solution, to engage in tinkering and try out multiple options when there is more than one solution. In the collaborations, there was a strong link to aesthetics visible: kids were seen to identify "experts" in the group who were known to be good at, e.g. drawing, or typing fast at the computer, or cutting clean with scissors), and making use of their expertise, whenever they thought they wouldn't be able to complete a task in the same skillful way, so it would hurt the aesthetics of their artefact if they tried.

By collaborating across club and country boundaries, the children learned how waste is a global problem that comes with different local specifications. The water supply in Palestine is limited and controlled by Israel, in the context of the conflict it is a valuable resource (Assaf et al., 2004). Thus, having to clean materials was not an option for Palestinian children, they seemed however unaware of that, a boy brought some empty bottles and tomato cans: *"My mother made pizza and I took the cans and cleaned them."*

The kids where advised not to wash material, but rather *"look for clean material"*.

Problem Solving

Problem solving in the project activity was concerned with a) finding solution for challenges in the making, and b) discussing strategies for a contribution they could make in their everyday lives as children to an overall solution of the global issue of waste production. The first aspect was visible especially during the initial exploration of materials and their characteristics. This was the case, e.g. when a team of boys in Club A was discussing options for the construction of wheels and "engine" of their cardboard car. They restart a construction drawing several times, erasing it and sketching something new on top. They comment their drawings loudly, explaining how they envision materials to behave. The second aspect unfolded, e.g. when children in Club A learned that all plastic bags used in Germany over the course of one year sum up to an amount that is enough to be wrapped around the equator 46 times. Impressed by the number, the group engages in a discussion about how they could help reduce the number of plastic bags used (e.g. *"Use a real backpack instead."*). Developed solutions later become a part of the children's digital upcycling stories.

12.5.3. Digital literacy

As the searching of information online was important in the upcycling, tutors in Club A approached this in a role play.

> Tutor: *"Shall we play search engine?"* The tutor lets one girl be the search engine and explains to the rest of the group: *"Imagine, you are now all websites."* Giggeling, as the tutor poses a search request: *"Give me all websites with blue pullovers."* More giggling, as the girl points to all kids in blue pullovers. Tutor: *"How did you know, whom to pick?"* Girl: *"I could see that."*
>
> The group talks about how a search engine does exactly this: search for the obvious. In a second round of play, the task is to find *"all children who are in the same class"*. The boy, who is now the search engine doesn't know the answer, because he doesn't know the group too well. So the group comes to talk about how there are hidden search criteria that can be in a website.
>
> The last task is to *"Find the teacher."* The tutor tells the kids that now they are all search engines, and they should all point their finger to indicate the answer. As all children point to the teacher, tutors explain how similarly, a search engine also looks for links between pages, thus ranking results as more or less "trustworthy". Finally, tutors create awareness how internet content can usually not be taken and reused without permission.

Subsequent sessions see the information that was embedded in this play be used, as the children seek the information needed for their upcycling stories. Awareness for digital ownership was deepened when the kids teamed up for creation of their digital stories. Here, children were eager to point out what share in the story they had created. Digital literacy in Club A was further refined when the kids engaged in the creation of images. Resulting from the group's examination of search engines, the kids discussed how widely their stories would be circulated – and whether or not they wanted to be a recognizable part of these. The group was eager to capture the making and ensured that each kid would have an equal share in taking the images.

There is a playful aspect in developing digital literacy. As a lot of environmental information comes across abstract, tutors help the kids discovering how numbers can be "translated", e.g. by putting the figure of 1,400 meters of paper per minute a papermaking machine can produce in perspective to the length of the children's way to school.

12.6. Discussion

In line with earlier works on tangibles (Fails et al., 2005; Gross et al., 2013), our findings indicate that the tangible approach of environmental issues in the upcycling is apt to support acquiring of interdisciplinary knowledge in children: not only did they discover facts about materials; they also understood and applied basics of digital literacy, copyright and ownership of digital media, and gained basic understanding of privacy issues relevant to their digital work. Our findings reveal signs of an evolving environmental awareness in the children on multiple levels. First, identifying problems regarding waste in their lives, then by researching information on waste, they experienced these problems not as singular but as an issue of global relevance. This was further deepened by the exchange of upcycling experience and related learning among children in both clubs.

The overall structure of the upcycling activity, from sourcing over researching the material to the actual creation of the artefacts, has facilitated a sense of empowerment among the children. By adding value through acts of making to materials that would otherwise have been thrown away, children practically experienced how "change" can be possible. This involved an active take on the avoidance of waste, as well as a conscious contribution to the shaping of local living conditions. The latter was especially relevant with regard to the children from Club B: Throughout the upcycling activity the Palestinian children expressed multiple reasons to build a "comfortable chair": living conditions in refugee camps are crowded, accommodations are used by larger, multi-generational families – there is not a lot of room to get comfortable. Their design of the water bottle bench was driven by the idea to create a *"feeling of sitting at the beach, because we cannot go there"*. Palestinians are not allowed to enter the Israeli territories which cover coasts at the Mediterranean and Red Sea and the kids are very aware of that. They felt empowered to not only change their environment (clean neighborhood) and build whatever they want (a bench) but also cope with their situation (living in a refugee camp in occupied territory).

The tangible upcycling encompasses creative decisions about materials based on experiences. Inherent to the exploration of and tinkering with (Bevan et al., 2015; Lyons et al., 2015) waste is a twofold learning experience, concerned with a) the value inherent to a material object, and b) material properties, relevant for the upcycling making and construction decisions. By extending these shared acts of exploration and tinkering to the digital world, a holistic approach to environmental learning is pursued and a sense of empowerment fostered in the young learners, who experience that change is feasible if approached in numerous small, creative steps.

12.7. Conclusion

Our study has shown how awareness for an environmental issue of global relevance can be fostered in a bottom up process. By exploring the development of environmental awareness as well as computational literacy in children through upcycling, our research supports the idea that the combination of handcraft and digital work, of documentation and social interaction is especially apt to foster the development of their identity as makers. We have shown that upcycling can sensitize children for environmental issues, foster their environmental learning and encourage them in the exploration of creative answers.

12.8. Acknowledgments

Thank goes to all participants from the neighborhoods, helping us to implement our research approach and contributing to make computer club be a lively experience.

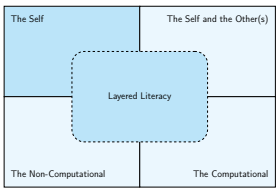
Part VI.

Literacy in come_IN

13. Discussion

This study explores come_IN intercultural computer clubs as a method to foster procedural, layered literacy among its young and adult participants in the local neighborhood. It discusses, how both, the cultural as well as the computational aspects of (local) everyday life can simultaneously be taken into account. We show how this implies varying degrees of movement and learning with regard to the *self*, as well as *the self and the other*, the *non-computational*, and the *computational* on the side of the children and adults as they engage in collaborative computer club activity in come_IN.

13.1. The Self



We have laid out in previous chapters how come_IN places an emphasis on identity. Even though it comes with a clear objective – to foster digital literacy, as well as cross-cultural understanding and respect – it does not require anything from its prospective participants in the first place. The name says it all: come_IN as a space and place for learning aims to welcome the young and adult people in the neighborhood in a decidedly open and unconditional way.

With every step taken – from the planning and setup of a computer club to technology design choices, the appropriation of pre-existing hardware, and then the planning and conducting of project activities – heavy reliance is placed on open structures and small steps. As shown in chapters 5 and 6, this careful establishment of a social, friendly and receiving setting seeks to encourage participation and with it the start of an individual learning process.

Who am I? This question marks the starting point of all learning in come_IN. And while it would be wrong to think that this question can be answered without the consideration of one's relations to other people – prominently among them parents and family, close friends and allies – the focus on the self in come_IN computer club activity aims to capture the moment *before* any kind of learning movement. A number of structural design choices are in place to secure this.

For one, come_IN does not follow a lesson plan but instead invites children and adults to bring their questions, ideas and problems to the weekly meetings. We have seen in previous chapters how this can be questions that are concerned with computer and media

formats and functionalities (How does a computer "think"? How come that images move in film? How do I find information online? And how do I know that this information can be trusted?). Equally, this can be questions that are concerned with everyday life topics from the family and local neighborhood context. All of these ideas, questions and problems are taken serious, and the computer clubs have installed mechanisms to emphasise this, e.g. by keeping and thus valueing topics, questions or problems that participants raised like treasures in a wooden *treasure box of ideas*, or by noting them on the computer club's pin board, so that they were always visible until being put into practice, answered or solved.

Furthermore, we have seen how come_IN was designed to enable all learning in small steps and at individual pace. Chapter 6 explains how this is secured in opening and closing discussion rounds, where questions can be asked, expertise be shared to solve these questions, completed project work be cherished, and upcoming activities be jointly planned. Section 5.5.1 shows how this corresponds with the needs and perspectives of the local neighborhood residents' very diverse educational backgrounds, and how come_IN as a place that comes with no requirements speaks to their local need for a place of learning that offers "the genuine possibility of participation without embarrassment" (see section 5.5.1 for a detailed description of these findings). Chapter 6 also shows how this atmosphere of unconditional welcome is further deepened by a dedicated time-slot for free play, learning and work activity in each club session – usually marking the opening of a session. We have seen in section 5.6.3 how this approach corresponds with Pablo Freire's perspective (Freire, 1970) to create close links to the language of the learners, so they are able to "have words" to express themselves throughout the learning, and be confident in their voicing of questions and ideas.

There is a material aspect in this as well. In her discussion of layered literacies, Abrams has emphasised the importance of an inclusive perspective on learning – one that includes the material aspects and matters of access as well (Abrams, 2014, p. 91ff). Abrams describes, how access is not equally distributed, inequities even proliferate, and come_IN recognizes this by promoting itself as an open space for learning, including the material side of this by enabling participation at no cost. Section 5.5.1 details how this creates confidence, especially among women in the neighborhood, who then take an interest to engage in computational learning in the computer club themselves.

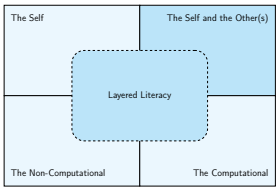
We have seen how there is an important social element in the recognition of the self as well. Chapters 5 and 6 especially show how teachers and tutors are an important element in come_IN as they secure the openness and welcoming nature of the space by providing guidance and help whenever needed, starting the sessions by welcoming all the participants, engaging in casual small talk with them, then asking everyone about their questions and plans, and securing the club's time management by guiding participants through the "free time" and "working time" parts of the computer club session. Also, they support learning in small steps and at individual pace by summarizing key aspects of the topics covered in the club activities in basic language on paper to be kept and worked with whenever needed. Furthermore, they encourage the young and adult participants

in the club to "bring in the self" to the project activities at stake: e.g. to express cultural background by choice of colours and characters in the project work, as was the case in the trickfilm activities (for detailed description see chapter 8), or to bring in individual perspectives on neighborhood life, as was the case with the neighborhood stories, scratch programming activities and the safe routes project (turn to sections 6.9 and 11.5 to read more about these projects). With this they lay the grounds for bi-directional learning dynamics to unfold, bridging cultural and social diversity (Arvizu and Saravia-Shore, 2017) to the level of the project work.

A further recognition and acknowledgement of the self is embedded in this. The expressive flexibility in the project work blurs the distinction between experts and learners. Adapting Lave and Wenger's notion of communities of practice, come_IN computer clubs enable participants to experience and actively take on the role of an expert as well as a novice with regard to topical as well as technological aspects of the respective project work. Vygotsky (1978) has described the zone of proximal development, where adults or more skilled persons can have a positive influence on (young) learners; in come_IN we see, how this recurring opportunity to be an expert strengthens confidence and motivation.

With this, the structure of come_IN takes up Giroux' notion of "alternative public spheres" (Giroux, 2007, p. 14), translating it to the local and intergenerational neighborhood setting. The interplay of all of the above described elements contributes to the overall aim – the fostering of computational literacy as well as cross-cultural understanding and respect – in a very fundamental manner, as it boosts the young and adult participants' confidence and thus motivation to engage in further learning. This is the point, where the concept of communities of practice Lave and Wenger (1991); Wenger (1998) reaches its limitations and procedural, layered literacy is needed as a lense to understand how the young and adult learners from the neighborhood are motivated to engage in the learning in come_IN after all: difficulties, problems, ideas and questions arising from cultural as well as computational aspects of (local) everyday life feed the individual learners' motivation to reach out to potential solutions and answers.

13.2. The Self and the Other(s)



Previous research has recognized the bi-directional nature of identity development. The self, such was acknowledged in previous works (see 2.2.1 for a detailed overview), can not only write culture. The reverse holds as well: individuals are written by culture as well. Both is fostered in dialogue and interaction with others. Seeking to foster and support cross-cultural understanding and respect among its child and adult participants, the collaborative project work in come_IN acknowledges that. It aims to create what Giroux has described as "alternative public sphere" to form and enact social identity in relation to others, thus building on previous studies (e.g. Rogoff, 1990, 1999;

Savery and Duffy, 1995; Webb, 1991) that have confirmed the constant interaction with the environment to be a needed pre-requisite for learning processes to unfold. come_IN seeks to produce the "everyday encounters" (Irani et al., 2010, p. 1313) that are needed to foster and support this learning in the socially and culturally diverse local setting. The previous chapters have shown how come_IN does so by adhering to a number of principles.

Prominently among them is the heavy reliance on a shared language. With joint opening and closing discussion rounds (for a detailed analysis see chapter 7), discourse among the come_IN participants is fostered, thus taking up constructivist understandings that knowledge and understanding develop as a result from a person's ongoing interaction with the environment, and fostered by the negotiation of ideas with other people. Also, the heavy reliance on local everyday topics in come_IN ensures that children and adults in the club can "have words" (Freire, 1970) to talk about their learning and perspectives. This was the case in section 5.5, when children, parents, teachers and tutors in the computer club discussed, how the computer club should be setup overall, as well as how it could make use of existing hardware in a sensible manner, and even design a new community platform to best match its needs.

Furthermore, shared rhythms and a shared understanding of time lay an important basis for constructive "everyday encounters" (Irani et al., 2010). Chapter 7 provides a detailed description of how come_IN ensures an interplay of technological and social orientation and structure that forms a stable support structure from the very basic level of individual tasks in the collaborative project work to the school-years-long time-span of an individual child (and accompanying parent's) computer club participation. Chapters 5 and 7 show how being patient with children, and being patient with others who learn at a slower pace is a central learning element in these "everyday encounters", and how this consideration can boost creative project results, because that way everyone is capable to contribute.

Constructive "everyday encounters" are rooted in the collaborative project activities in the club, which frequently invite participants to not only express themselves but also see themselves in relation to others – in the club, in the neighborhood, and beyond. Chapter 8 shows how the trickfilm activities triggered discourse about topics like friendship, and the young and adult learners involved not only focused on themselves but decidedly looked at themselves in relation to others in their everyday life. Similarly, the upcycling making activities (for a detailed overview see section 12.4.2) triggered the children's thinking about environmental aspects of local neighborhood life, and created awareness that these are issues of global relevance that can have very different characteristics in different places around the world.

There is a spatial dimension to this as well. Firstly, this refers to the computer space where the club sessions take place. Here, teacher and tutors involved in come_IN as facilitators secure that the arrangement of tables in the computer space is done in a way that supports communication and close collaboration among the young and adult learners involved. Secondly, this refers to the project work itself. Chapters 10 and 11 discuss, how collaborative project activity in come_IN actively involves *the other(s)* from the

neighborhood, triggering discourse and the exchange of perspectives, e.g. by producing "neighborhood stories" (see section 10.6.1 for a detailed description) about beautiful and ugly places in the neighborhood, or by sparking discussion about safety on the way to school with a "Safe Routes" project (see section 11.5.3 for a detailed overview). This can be seen as expression of procedural literacy (Bogost, 2005) – the understanding and experimenting "with reconfigurations of basic building blocks of all kinds" (ibid., p. 36): shaping a joint project from multiple perspectives, materials, technology, skills and ideas (= the building blocks).

Along the lines of Lave and Wenger's communities of practice (Lave and Wenger, 1991; Wenger, 1998), mutual help in the computer club is encouraged: whenever tutors see that a participant in come_IN has completed a learning step, this participant is encouraged to take over a teaching position and pass on the newly acquired knowledge to someone else facing the same question or problem (e.g. Weibert et al., 2016, 2017a).

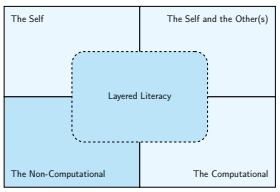
This importance of the tutor again points to the limitations of communities of practice (Lave and Wenger, 1991; Wenger, 1998) as a lense to explain and evaluate the effects of come_IN: it shows that the recognition of experts and learners comes natural, but that the transition from one role to the other and back is one that needs support. It points to the importance of time as a factor for trustbuilding as a needed pre-requisite for the community to develop; furthermore, it indicates that the transition between the positions of expert and learner is not natural - rather, this fluidity of roles develops over time, and with the support of the tutors in the computer club.

The author of this study herself has seen this development in one of the clubs in Dortmund Nordstadt. In project works in the computer club in the beginning it used to be the case that the accompanying tutors were at the center of of all questions of the young and adult learners. Only gradually patterns of debugging were developed and taught among the children themselves, as the following scene from a project combining electronics and origami may exemplarily illustrate:

> Boy I (frustrated, because a circuit he had created with copper tape on paper would not light up): *It does not work..*
>
> Boy II (seeing Boy I giving up on trying to figure out a solution): *You need to check, if you created a short-cut. If no: check that all the LEDs make a good connection to the copper tape and that you put them in the right direction.* (smirks) *If it still does not work – ask me.* (smiles even more) *If nothing works, we'll ask Anne.*

This pattern of mutual help and fluid changes among the roles of experts and learners was seen among other participants in the club as well, and it carried on throughtout other project activities, in this computer club and beyond (see section 6.8 and section 7.6.3 for further reference).

13.3. The Non-Computational



In the socially and culturally diverse neighborhood, come_IN takes an explicit focus on the young and adult citizens, who initially 1) do not see the relevance of computational expertise in their everyday life, or 2) do not consider themselves capable of mastering these skills (even though they sometimes painfully experience the necessity to be able to participate in digital aspects of everyday life – e.g. when job-search or finding a flat require basic computational understanding).

The previous chapters have shown how come_IN acknowledges, even explicitly values this in its approach to foster a computational and cultural literacy. It does so by actively creating links to individual skills and crafts, as well as neighborhood actions, activities and perspectives that do not (yet) contain a computational element. The upcycling making activities (see chapter 12) are a prime example for this, as they combined the children's crafting skills as makers with their computational skills in digital project stories about the upcycling making, where the children learned how the computer can be a tool that enables them to share their learning experience and thus even be a potential role model for others.

Including a focus on the non-computational in the collaborative project activities in come_IN, grounds the understanding of the computer and ICTs in common everyday life, thus supporting their perception as tools for expression and creativity. Chapter 9 shows, how the non-computational is explicitly valued by building a project activity on sewing - a skill that comes with ample close connections to local everyday life, and which includes an explicit cultural component, as sewing is a popular craft among several of the migrant communities in the neighborhood. Combining this traditional craft with programming and electronics came with a bi-directional learning effect for the young and adult learners. For one, it enabled girls and women to experience electronics, computing and programming in a new way and see that there can be an aesthetic, creative component to it they had not noticed before. Secondly, it enabled the participating boys to relate a supposedly female craft and skill – sewing – to technical skills that they valued (see section 9.5 for a detailed description of these findings).

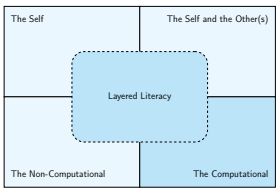
In line with Abrams' focus on the material aspects and matters of access (Abrams, 2014, p. 91ff), project work in come_IN seeks to work with everday materials like paper, cardboard and fabric – things that are easily accessible and do not necessarily be bought but can also be used material, as was the case in the upcycling making project (see chapter 12), as well as the "travelling dragonflies" (see chapter 11). The reliance on paper figures and play characters enabled children in the trickfilm activities to "take home" the learning experience and prolong it to family and leisure time contexts, thus grounding newly acquired computational skills in familiar, non-computational settings (see chapter 8).

The active emphasis on tangibles is in line with constructionist views on learning. The open structure of come_IN, which decidedly does not follow a lesson plan but instead follows the ideas of the young and adult people from the neighborhood, takes Papert's focus on materials, tools and tangible artefacts as objects-to-think-with to the diverse local neighborhood level. A storytelling project activity with migrant women from the neighborhood exemplarily illustrates this (Weibert et al., 2017a): in this computer club project, the women of diverse cultural and migration backgrounds told their migration histories by first staging them in a tangible way with meaningful artefacts from their everday life, and then creating interactive digital versions of these stories combining sound and images. That way, combinations of non-computational and computational forms of expression could be explored, and the women experienced how both forms in combination can make for valuable and creative expressions in their local family and neighborhood context.

Non-computational elements have an important function in the creation of the overall open and low-threshold atmosphere of come_IN. This is the case, when a cup of tea or coffee accompany the opening time for free play and activity in the computer club, so that adult learners who are still hesitant in their approach to ICT and computational learning are encouraged to participate. The "treasure box of ideas" is another non-computational element supporting these learners by valueing their ideas and questions in a tangible and approachable manner. By "treasuring" even the most basic questions, the box signals that it is ok to not know, and to take small steps in acquiring computational skills.

And finally, the focus on the non-computational in the project work functions as a boost for motivation especially with regard to the young learners involved. The e-textiles activity (see section 9.5), as well as the upcycling making (see section 12.4.2) and the Safe Routes project (see section 11.5.2) exemplarily illustrate how the involvement of the tangible and non-computational enables the learners involved to "take home" the learning and integrate it to their everyday life, by showing it to peers, or actively using it in everyday life situations, e.g. on the way to school.

13.4. The Computational



We have seen in section 2.2.2 how the ability to become computationally expressive requires a profound understanding not only of computers (and programming). It involves a broad mind-set that is capable to create the connections between the non-computational and the computational – to identify, how information and computer technology can make sense to an analog everyday life topic or problem at all. come_IN puts this into practice by employing information and computer technology as expressive tools to be creative about one's own development and learning, as well as about one's neighborhood surrounding. Connecting these learning experiences via a closed online community platform come_NET, basic understanding of the functioning of social media is supported in a playful way (Aal et al., 2018). Again, the digital is carefully balanced towards the non-computational, as images from the children's everyday school life, such as a blackboard, or chalk and sketch notes are deployed to create an understanding for the digital space and the visibility of artefacts.

Computational thinking as a skill- and mind-set is approached from the local neighborhood level, taking into account its tangible, social as well as cultural dimensions in the sense of "connected learning" (Kafai and Burke, 2014), thus creating ample opportunity for the "active experimentation with basic building blocks in new combinations" that Bogost has described to lay the grounds for the building of procedural literacy (Bogost, 2005, p. 36). This was the case with the trickfilm activity (see section 8.7), where the children and adults were seen to experiment with computational and non-computational forms of expression, thus actively creating knowledge by weighing their advantages and disadvantages against each other. A zooming effect is a matter of a few clicks with the computer and a visual programming software like Scratch (Maloney et al., 2010). But it is a complex task involving multiple crafting steps when approached from a tangible, two-dimensional side with paper characters in a series of stop-motion images. Following their self-made narrative in the trickfilm project, the children and adults were able to actively experience these kinds of differences, and in doing so develop a mind-set that enabled informed choices about the computational and crafting tasks involved in the creation of the film.

Similarly, the "Travelling Dragonflies" activity (see section 11.5.3) serves as an example to illustrate the fostering of this mind-set. It shows how an awareness for the usefulness of digital skills is facilitated by creating close links to neighborhood topics and experiences. Children and adults involved were able to explore computational forms to express individual views and topics in the travelling destinations of each dragonfly; and subsequently the children were able to experience the usefulness of skills involved in the project, when the progress of the dragonflies became a topic in their regular school lessons as well, and they were able to employ reading, writing and calculating skills in relation to this project that they considered to be a fun experience (Weibert and Aal, 2013).

The participating children in the upcycling making activity (see chapter 12) initially had at best very little sense for the usefulness of a digital skill-set that enabled them to make informed choices online. As a part of their involvement of the project they came to think and learn about aspects of privacy, content ownership, and assessment of content credibility. And they happily engaged in this learning and skill-building, because they were able to see how it related to their everyday life.

Along similar lines, the storytelling activity (Weibert et al., 2017a) promoted awareness for shared experiences, and the participating women were able to experience computational skills as helpful in starting a (project-mediated) dialogue thus creating an audience for neighborhood topics that were meaningful to them as individuals – e.g. the value of education and literacy for boys and girls alike, or ongoing discrimination of communities like the Roma people within the city and beyond. The Neighbourhood-stories (see section 10.6.1) functioned in a similar manner, first promoting ICT as a means for digital expression of individual perspectives, which then, when distributed in the format of stories on paper, created awareness and discourse for different opinions and fostered the negotiation of these.

13.5. Fostering a Literacy: Balancing the Self and the Other, the Non-Computational and the Computationial in come_IN

Aiming for a combined answer to increasing 1) digitalization, as well as 2) diversification with regard to social and cultural backgrounds involved, come_IN is a method that can be a means to foster procedural, layered literacy among its local, young and adult participants. It does so by carefully balancing the above discussed four elements of local everyday life in the collaborative project activities: *the self*, *the self and the other(s)*, *the non-computational*, and *the computational*.

We have seen in sections 1.2 and 2.2.2 how scientific discourse in HCI and related disciplines, as well as in education, has long taken an interest in how to be inclusive and broadly appealing to a diverse set of learners with regard to the fostering of computational skills. So, the question how to actively engage young and adult people in making sense of computers and ICT, in essence, is one that is concerned with how to create a positive and motivational learning environment – one that enables them "to make technologies at home in their world" (Stevens and Pipek, 2018, p. 139), as much as it allows them to develop a sense for the cultural diversity of their local environment, and an understanding how they want to position themselves within.

The above discussion illustrates how in come_IN, this learning is a matter of carefully balancing the four elements – *the self*, *the self and the other(s)*, *the non-computational*, and *the computational* — in the project activities. Previous sections have shown how collaborative project work in come_IN never challenges all four elements at once, but

rather places an emphasis on one or two of them in combination. That way, a learning situation is created, where participating children and adults are never put in the position of not-knowing novices at all four ends simultaneously. Instead an atmosphere of give and take is created where they can bring in their expertise on specific aspects as well.

The migrant women engaged in acquiring computational skills, such as editing of photo and audio materials, and the handling of digital storytelling software, because it enabled them to bring in their expertise as members of a specific neighborhood community – the story was about them, and thus meaningful. Similarly, boys and girls alike engaged in the e-textiles activity, because the activity challenged their experience and skill-set at one end, while providing the opportunity to be an expert at another end: along binary gender lines, boys were challenged in their perception of sewing as a "female" skill and inclined to refine their non-computational skill-set because it came along in combination with electronics and programming; in return girls and women engaged in acquiring computational and electronics skills because they were able to experience this in close relation to the aesthetic creation of something that they considered to be pretty.

Ultimately, this balancing puts into practice what Abrams has described as the ability to "relax and breathe" with technology (Abrams, 2014, p. xix), because it enables learners to relate the new and the familiar in the activity itself, thus immediately making sense of the learning effort that is needed to achieve a certain goal. Resnick et al. (1996) have discussed this in a similar manner, employing the image of pianos instead of stereos as important for the learning of computational skills: while pianos invite the creation of music, stereos only allow the playing of the music that others have created. We have seen and discussed above how collaborative project activities in come_IN aim to be just this: the opportunity to engage with unfamiliar (computational as well as cultural) aspects of local neighborhood life, while at the same time engaging with everyday life objects, and in activities that are meaningful and familiar. Papert has talked about the creation of "interesting microworlds" to foster learning (Papert, 1993, p. 140). come_IN seeks to present these microworlds in a familiar way, thus enabling participation to a broad spectrum of learners, and explicitly welcoming those who were yet to become familiar with computational as well as cultural learning experiences.

14. Conclusion

This study has explored how come_IN can be a method to provide a combined response to 1) social and cultural differentiation, and 2) a digital divide (Norris, 2001; Wagner et al., 2002) resulting from the increasing permeation of everyday life with ICTs.

It has shown how a careful balancing of *the self* and *the other(s)*, *the non-computational* and *the computational* can be a means to engage and motivate learners of very diverse backgrounds. Bringing together the computational as well as cultural skill-sets needed in a concept of procedural, layered literacy has enabled us to see how come_IN is capable to train its young and adult participants in making informed choices, when navigating cultural diversity in their local neighborhood context, as well as when handling the analog and digital facets of local everday life.

Openness, small steps and the heavy reliance on visual and haptic, non-computational elements all speak to the broad diversity of (ICT) skills and educational backgrounds involved in the neighborhoods where come_IN is active. The combination of these structural elements in the computer club setup creates a learning setting that tends to skill building needs in the most basic area of literacy and ICT basics, while at the same time fostering advancement in the areas of ICT orientation and ICT literacy, thus advancing understanding that Collin et al. have described earlier in their conceptual framework of ICT use among migrants (Collin and Karsenti, 2012; Collin et al., 2015). In taking a layered approach to skill-building, come_IN blurs the line between novices and experts, thus creating a rather fluid learning situation, where motivation is fostered by the recurring opportunity to contribute to the overall project as an expert as well. It acknowledges Giroux' perception of power dynamics involved in the fostering of literacies (Giroux, 2007). It translates Freire's notion of literacy as a social practice that comes with an element of freedom and emancipation (Freire, 1970), to the diverse local neighborhood level: by acquiring a layered literacy, combining computational as well as cultural skill-sets, come_IN enables children and adults in the neighborhood to be creative about their local ways of living (together) – and to experience ICTs as productive means to enable positive change.

To achieve this, the active appreciation of the individual in combination with a reliance on basic elements of etiquette, namely the division of club session time in leisure time and working time, as well as the establishment of opening and closing discussion rounds where the voices of young and adult participants are equally heard, create a common ground to rely on. This takes up Cook's notion of productive and meaningful collaboration (Cook, 2002), and is important in a setting, where there are a broad range of cultural factors as

underlying factors determining development and progress (as well as the lack thereof).

Finally, affordability and an atmosphere of give and take both speak to the material aspects of the initiative. In line with Abrams (2014) focus on material and monetary matters of access to computational learning, it is ensured that not only will computer club and its collaborative project activities be within the financial reach of the young and adult local residents, but also that it doesn't violate their pride by enabling and encouraging their input, practical commitment and contribution as well (e.g. when mutual help and sharing of expertise is explicitly encouraged). Even more: the reliance on accessible low-cost materials and equipment enables and encourages the continuation of learning experiences that have started in the computer club in family and friend contexts in the local neighborhood.

It lies in the qualitative and situated nature of this study that its insights are of limited generalizability. However, the long-term view on come_IN and its effects resulting from collaborative project work in a number of local contexts does provide rich, deep description and explanation that is instructive beyond the specific research sites.

The individual is at the center of come_IN – and this is a strength and a weakness at the same time. While the decidedly open nature of the initiative, and its active appreciation of the individual(s) involved has proven to be appealing to children and adults in the diverse local neighborhood alike, it requires continuous involvement on the sides of all stakeholders. come_IN is not self-propelled – it has to be wanted to make it work.

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