come_NET – Connecting Computer Clubs with a Community Platform

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Abstract

Our case study discusses the design and implementation of an online platform "come_NET". In the context of intercultural computer clubs in Germany. This tool was built in close cooperation with the children and adult computer club participants. It was designed to foster the sharing of ideas and experiences across distances, support collaboration, and make skills and expertise accessible to others in the local neighborhood contexts. The participatory design process involving the children in the computer clubs especially, fostered, we argue, a profound understanding of the platform structure and functionalities. Study results show how younger children in particular were able to benefit, as the closed nature of the platform enabled them to gather experience as users of social media, but in a safe and controlled environment.

Introduction

The come_IN initiative of intercultural computer clubs aims to foster and support understanding and respect across cultures and generations by means of collaborative project work with computers and modern media. With this, come_IN contributes to societal efforts to come to terms with migration and an increasingly socially and culturally diverse population on the most basic level of local neighborhood communities. It is here, where come_IN translates the general ambition of cultural integration – concerned with the creation of a common basis for living, involving an agreement on a common language, core values, common rules and mutual respect for and knowledge of social and cultural differences [7,8] – as well as structural integration, being concerned with equal access to all parts of societal life [32], into weekly project activity involving information and communication technology (ICT) [1,31,35,42,44,45].

Mostly located in schools in socially and culturally diverse neighborhoods, the come_IN computer clubs bring together people of different migration backgrounds and different ages. In the clubs weekly meetings the children as well as adult participants work on joint projects, study and play.

This speaks to the social dimension of integration in that it fosters intercultural as well as intergenerational discussion, negotiation of opinions and perspectives, and the acquiring and refining of language skills. It tends the structural dimension of integration in that it contributes 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. [21,41,47]) providing open, yet guided access to modern information and computer technology. Come_IN computer clubs follow a decidedly open structure. 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 provides help and guidance but does not set up a predefined schedule to follow for the clubs' weekly meetings.

Having grown into a network of several clubs in Germany (as well as in Palestine [1], more recently), the need for a tool that would allow sharing of ideas and experiences across distances, foster

collaboration and make skills and expertise accessible in a sustainable way emerged. There are numerous social media and sharing platforms available. However, the collaborative nature of computer club activity, and the young age of most participants demanded for the development of a specific, new platform. Thus, the online platform *come_NET* was designed in close cooperation with the children and adult computer club participants to best meet their skills and needs. The work we describe takes place within the general context of the 'design case study' [49] and the associated notion of 'grounded design', but carries with it some specific challenges. These entail precisely those associated with working with children and those associated with the working across a range of cross-cultural values which can sometimes be in conflict.

Related Works

come_IN Computer Clubs

In intercultural neighborhoods in Germany, the structure of intercultural 'come_IN' computer club serves the aim of supporting integration on the local neighborhood level ([31,35,45]): designed as an open space for computer-related project work, the clubs bring together children and adults from the respective neighborhoods to work on topics of their own choice. Also, a teacher from the school participates in the computer club [43]. Tutors provide technical help and support the club participants in the translation of the ideas and topics that they bring to the club into a computer- and media-related joint project activity. The neighborhood has a large impact on the project work that club participants jointly decide upon (e.g. [44]). Project examples are 'neighborhood stories' about interesting, nice or ugly places in the quarter that children and adults in one of the club assembled in several little brochures, a stop-motion film about friendship that another club has created or a video-project about the breakfast for children initiative in one of the elementary schools.

With the above-mentioned, the intercultural come_IN computer clubs have built upon the concept of computer clubhouses in the US and extended this concept to meet the needs of the German setting. Those computer clubhouses have been established in numerous cities in the US and around the world to serve the disadvantaged inner city youth and open up opportunities by helping youth to increase their technological fluency and creativity. Their success is well documented in research (e.g. [15,19,24,25]).

Sharing Tools

Sütl et al. describe sharing to be "one of the most unexpected developments of the early 21st century" [36], resulting from easy and almost omnipresent access to advanced information and communication technology for sharing and communicating. Platforms like Facebook, Snapchat, Twitter, Instagram and so on are very popular, and there are numerous platforms that have been designed and set up to address specific sharing needs, e.g. of photographs and video, animations and programming, written stories, cartoons or artwork. A particular aspect of sharing is the 'knowledge sharing' and 'expertise sharing', which is about using the practical knowledge and expertise of members to solve problems or get work done [2]. Research in CSCW and HCI has followed this development closely, exploring sharing practices, and designing tools and software to meet specific requirements (e.g. [5,16,17,46]).

Children take up a specific role with regard to the above: as their comprehensive as well as reading and writing skills are still developing, they cannot yet fully anticipate the consequences of their working online, or grasp the often complex structures, e.g. of privacy settings. Thus, social media and

sharing tools designed for them need to fulfill specific, age-related requirements. Numerous studies have followed up on this, exploring 1) how social media and sharing tools can contribute to child learning (e.g. [3]), and 2) support creativity (e.g. [27]), as well as 3) an interest in science (e.g. [4,51]).

Sharing tools have also gained attention as a means to support distributed communities and their activities. One popular example is the network of Intel computer clubhouses (mentioned above), with clubhouses that are located in various countries around the world: these clubhouses have been connected via a shared intranet called "The Village"[1]. This online platform enables clubhouse participants to network, collaborate, share and discuss their projects (e.g. [13,37,38,39]).

Children as Technology Users / Design Partners

It is clear that today, media and technology are omnipresent in children's lives. They grow up in close contact with video games, television and "touch technology". In such a case, a complex media competence is necessary. Baacke (1996) gives priority to youth work, which offers children other and more accesses to new media than school can otherwise do. Media use in activity-oriented media education includes reception as well as production. Therefore, children need to develop from the role of a sheer consumer into "a prosumer" [40],which means that they adopt and consume media content as they actively produce it.

"Children are experts at being kids" [10]. So they probably are most qualified to say, it can be argued, what children want, need and are able to handle. HCI research has identified three designing methodologies to be productive when working with children: 1) Contextual Inquiry [14], gathering field data from users within their normal context, 2) Technology Immersion [9], applying the observation techniques of contextual inquiry in a decidedly technology-rich environment, and 3) Participatory Design [10,11,20], entailing that users and designers view each other as equals, and relying on techniques that can support intergenerational design teams involving children.

The design and implementation process of the online community platform come_NET builds up on these related works in that it relies on co-operative and contextual inquiry as designing techniques viewing and involving children in the design process as equals and within their usual setting and context. It speaks to related works on sharing practices and tools in that it applies them to the specific local setting of intercultural computer clubs and the needs of children as users within that context. Here, a platform was needed that was able to 1) cater for the specific needs of younger children with regard to privacy issues as well as their developing literacy and cognitive skills, and 2) foster the sharing of ideas and knowledge in a specific local, intercultural setting. As existing platform solution fell short on one or both of these requirements, there was a clear need for the design of a platform that met the specific needs of the computer clubs and their participants.

Case study – come_IN computer clubs

Research Setting

Over the course of the last decade the come_IN project has established a network of eight computer clubs in Germany. The first 'come_IN' computer club was opened in Bonn Nordstadt in 2004. In Siegen, the transferability of the concept was tested in 2006 with the establishment of a second club. The experience gathered in Bonn helped to refine social and technical aspects of the concept. The

[1] http://www.clubhousevillage.org

'come_IN' initiative grew into a network when four clubs were 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 neighborhood 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. In summer 2010 another club followed in a comprehensive school in Kreuztal.

Figure 1: Computer club locations within the German state of North Rhine Westfalia

Club	Type of School	Year of Foundation	Participation	Cultural Backgrounds	Specific Features
Bonn Nordstadt	Elementary School	2004	2 adults, about 10 children	German, Turkish	Temporally parallel to all-day school. Currently not running.
Bonn Tannenbusch	Secondary School	2009	One complete class (6th grade), which does not focus on sports or music; parents are invited but not all of them	Polish, Russian, German, Turkish, Iraqi, Iranian	Obligatory for the children, and part of their regular lesson plan.

			participate		
Bonn Tannenbusch	Elementary and Middle School in combination	2009	2-3 mothers and 6-7 children. High fluctuation among the participants.	Polish, Russian, German, Turkish, Iraqi, Iranian	Managed by Elementary School and Middle School Teachers. Currently not running.
Dortmund Nordstadt	Elementary school	2009	5-7 parents (mostly mothers) and about 10 children	Turkish, German, Russian, Macedonian, Moroccan.	Formation supported by neighborhood managers, local residents and a local community organization. Meets parallel to all day school.
Kreuztal	Comprehensive school	2011	About 20 children from the 6th. Grade	Turkish, Moroccan, German, Russian	Part of the optional course plan of this school.
Kreuztal	Community center	2009	Older adults and teenagers	German, Serbian	Senior citizens and teenager collaboratively developed a concept for the club. Previous experiences showed, that both groups work separately. Meets in late afternoons.
Siegen	Elementary school	2006	7 children and four parents or older siblings	Turkish, Russian, German	The club has established „its own“ computer room. Temporally parallel to all day school.

Table 1. Overview on computer clubs and their characteristics.

Even though decidedly open, the project work in the computer club follows a few set structures. First among them are the opening and closing joint discussion rounds that begin and end every one of the weekly 90-minute club sessions. This is the place where ideas for club projects are developed and decided upon, where all activities are planned, and problems are solved. When it became apparent that children and adults were not equally capable of letting their voice and opinion be heard in a circle like this, it was decided that the discussion rounds would have a moderator team of a child and an adult – thus caring that no one was left behind. Another fixed part of the weekly session is the free time at the beginning for individual activity, followed by the main working time devoted to the

respective joint project. Furthermore, an important aspect of project work in the club is the aim to involve several generations. From the start, a parent-child rule had been established, stating that children could only participate in come_IN together with one of their parents. Later, this rule was changed, when it became apparent that this way, children were excluded who would benefit most from the club. Children participating in the club are still asked to bring an adult, wherever possible, but it can be a family friend, the older brother or the grandma, for example. Thus, the clubs aim to foster intergenerational learning that may find its continuation in family contexts long after the computer club session is over.

Method

Design Case Study

Wulf et al. (2015) have emphasized, how in order to be able to achieve appropriate design, there is the need to better understand the relationship between specific instances of social practices and the design space for IT artefacts in their support. The design of IT artefacts needs to take the given social practices, including the already existing IT infrastructures into account [ibid]; allowing context-sensitive 'Grounded Design' [28,34] to emerge. However, when these artefacts are rolled out 'in the wild', these practices undergo changes during the appropriation process. We need to understand the interaction between the IT design and the appropriation activities over a longer period of time [22,29,49,50]. Thus, in order to assess the field of application, the pivotal actors and their practices, the design case study in our come_IN computer clubs consisted of three phases:

(1) *Empirical Pre-Study*; assessing the social practices prior to the intervention, describing already existing tools, media and their usage, as well as capturing the development from a technological, organizational and social perspective [49]. Against this backdrop, the first phase of our case study was conducted while building the computer clubs. We studied common practices in the clubs over three years, thus identifying re-occurring patterns and challenges that would then be addressed by the platform design.

Adopting a participant action research approach [18] the members of the come_IN research team are active members of the computer clubs, where they act as tutors on a regular basis. They document the weekly sessions in the form of jottings that are later written out in the form of field notes [12,48]. Their focus in very general terms lies on the interactions of children and adults during computer club project work, their observable collaborations, and on children's and adult's appropriation of media and computer technology, as well as associated processes of learning. Over the period of four years, weekly field notes (all in all around 300 pages) were collected and analyzed using a qualitative content analysis approach.

(2) *Prototyping/(Participatory) IT Design*; We describe the innovative IT artefact from a product as well as from a process perspective. This includes a description of the specific design process, the involved stakeholders, the applied design methods, and the emerging design concepts. This includes the changes in social practices the stakeholders anticipate and aim for, how these considerations have influenced the design of the IT artefact, and how they should be documented [49]. Methodologically, we applied a combination of qualitative methods and context-specific research approaches, focusing on incorporating end-users immediately in the software development process, while taking into account their specific needs and the contexts of their ICT appropriation, as well as

the interaction going on between the IT design and the appropriation process. Accordingly, a first prototype of the platform was developed, which then was tested with several children (around 30 younger children and 10 older ones) in usability tests. These were conducted during the weekly club sessions in several computer clubs. We applied a Participatory Design (PD) process [20], engaging the end users, i.e. children, as design partners in the development process of 'their' online community platform come_NET. In the beginning of this process, several planning sessions in the computer clubs involved children and tutors in the assessment of crucial features and functions, thus in principle ensuring design according to children's needs [10], alleviating several reoccurring problems, such as difficulties in retrieving personal files in the network storage, and making the sharing of personal digital creations possible in a secure online environment, as well as allowing safe online -networking and -communication among the immature club participants.

(3) *Evaluation/Appropriation Study*; the introduction, appropriation, and potential re-design of the IT artefact in its respective domain of practice should be documented [49]. Together with our participant observation in the computer clubs, additional qualitative interviews with the children of the clubs in Bonn, Dortmund and Siegen helped us in this phase of our study (see Figure 3) over the course of one year to assess the appropriation of the platform and to inform the iterative redevelopment and refinement of its design and features.

Empirical Pre-Study: Re-Occurring Challenges in the Computer Club Work

Over the course of almost ten years of project work, several re-occurring challenges became evident in the come_IN computer clubs. In our pre-study, we have collated the most central issues, which we illustrate below. These issues have emanated from the overall project work and activities of the children and adults in the computer clubs.

Many of these issues are concerned with material aspects related to the project work in the clubs. Due to the fact that most come_IN clubs are conducted in the premises of cooperating schools and dependent on the participation of the respective tutors and teachers, participants' engagement in project work is usually limited to a single 90-minute meeting per week. But large projects in the computer club may at times demand work efforts that exceed regular club times. Time-consuming tasks, such as video editing or the creation of large Scratch projects [26] demand efforts that exceed regular club times. As a result, participants have repeatedly displayed their wish for an option to work on projects independent of regular club hours and be able to access and process their project data at home. *"Time's up",* the teacher and tutors would regularly be heard, announcing the end of the club session, and the children in the club receiving this with disappointment: "*But I'm not finished!"*, they would protest, and some would demand to know whether they would be able to continue their respective activity from home as well. When this was not possible, children would sometimes return to the club in the following session with a project creation of their own – thematically related to the overall project theme, but individually made. One example are two boys from the computer club in Dortmund, who returned to the club having taken hundreds of photographs of their Lego figures performing the story of a police chase that the boys had observed in their neighborhood, as well as their very own cover version of a game of "Super Mario". The joint project activity in the computer club at that time was the creation of a trickfilm and the two boys had sought a way to be able to pursue this topic further at home. A trickfilm is a kind of animated cartoon [33]. It is a format that is popular among children and youth in Germany.

Field notes repeatedly report the securing and sharing of artifacts, as well as the retrieval of project data, to be a problem especially for the children in the clubs. The children frequently lack an overview of where they've stored their data when they continue their project works in the club the following week. A scene from the computer club in Bonn illustrates the issue:

Girl: *"Oh no. My work! It's all gone!"*
Tutor: *"Did you save it?"*
Girl: *"Yes! But now it's not there…"*
Tutor (looks): *"See – there it is. You were looking into the wrong folder."*

Many children face problems retrieving their last week's project data on the local storage drives, usually because they are not able to memorize the file's name or location over a week's course, occasionally because their data has been moved or deleted by other users. As a result, children (and tutors) have to spend time searching for the data, thereby losing considerable parts of their already limited time for progressing with the actual project work. This was an irritating and time-consuming issue for the parties concerned, also causing projects to take longer than originally anticipated. Also, children frequently have problems to complete up- or download processes.

Furthermore the clubs face problems related to privacy issues: some computer clubs did not have a secured drive at first, or all participants could access all of the club data – with frequent loss of data being the result when someone accidentally deleted something.

With regard to the project work itself, all computer clubs share the requirement that expertise and help among the young and adult participants, when sought, can easily be identified and made use of. Especially in those clubs where not all children are initially known to each other, they are often not aware pf mutual interests and relative skills, as a result sometimes finding progress with a project task difficult, initially not knowing whom to ask (besides the tutor or teacher) in order to overcome a problem. "*Ok, who can help*", teacher and tutors are frequently heard to say whenever a problem occurs during club work, thus fostering an atmosphere in the club, where the children and adult participants can help each other and master difficult tasks, where possible, by themselves. The social distribution of expertise, where different skills reside in different places and 'knowing who knows' about potential solutions, (e.g. to perform a certain programming task, or to draw nicely) are problems to be overcome. Joint discussion rounds at the beginnings and endings of the club session, therefore, have been established in the clubs to plan upcoming project work and find solutions for unresolved problems that may have occurred during the session.

Secondly, the computer clubs also share challenges on the social level. On a basic level is the challenge to come up with an idea for a new computer club project. Where does one find inspiration? A scene from the computer club in Dortmund illustrates the issue:

Boy, sitting in front of his computer, undecidedly clicking around: *"Now what? I'm done."*
Teacher: *"Let me see."* The boy demonstrates and explains the project he has just finished.
Teacher: "*This is cool. Great job!*"
Boy, looks around: "*Now?...*" He wanders around the room, looking at the activities of others, then sits down near a book shelf in the corner of the room, flipping through various books. After a while, he returns to the computer: "*I'll do a shark. Those are my favorite.*"

Another challenge is related to turning an inspiring, but perhaps not well formulated, idea into an interesting project in the computer club, ideally spanning a broad range of competences, skills and interests. Here it is especially challenging for the young and adult participants in the club to estimate challenges that may occur in relation to the implementation of a project idea in the computer club. This was the case, e.g. when the computer clubs in Dortmund and Siegen decided to do an audio play, and children and adults learned by doing about the complexity of audio recording and editing. These challenges fed the computer clubs' demand for networking and an exchange of respective experiences with past projects.

Regularly, a major change of participants takes place in the computer clubs, when children have grown out of elementary school age and leave for secondary school. Especially those, who have spent a long time in "their" computer club, voice a need to stay in contact with the computer club beyond their attendance of elementary school. "*Can I come back?*", a girl in Dortmund requested to know at her last day of computer club before she left elementary school for secondary modern school. And a boy from the computer club in Bonn later became a computer club tutor, when he was a teenager in secondary modern school. Another boy from the club in Bonn was seen to return to the club week after week, long after he had left elementary school.

Also, on a weekly basis many of the children want to spend more time together than simply at the weekly club session. Some already know each other from class; others have discovered in the club that they share an interest or a hobby, like playing soccer or dancing. Furthermore, field notes reveal that children are always curious about the network nature of the computer clubs: they like the idea that there are other children in other computer clubs engaged in project works similar to their own. Field notes report the children to occasionally ask the tutors about the participants in the other clubs, who they are, what they do and what their projects are. This interest is triggered, e.g. by project activities where tutors tell about experiences with similar activities in another club. Also, an annual joint computer club excursion called 'Aktionstag', bringing children and adults from all clubs in the network together in one place further fuels this demand for further exchange and communication. With all of the above, the teachers and parents in the computer clubs are always concerned that this communication and contact was enabled in a safe manner.

Participatory Design: come_NET

Based on the challenges and patterns occurring in the pre-study the need for a save communication tool became evident that would allow to stay in touch after club sessions, share and manage own digital projects, and to find expertise and inspiration from other's shares. As a result of parent's concerns regarding open online community websites and after several requests by participants, the development of a closed community platform was initialized. Since children were the target audience for the new system, great attention was paid to privacy issues and, due to the low age of the users, their low experience in general, special requirements had to be taken into account. In order to meet those requirements best, the young end users were regarded as crucial stakeholders and design partners in the participatory development process. The technology used had also a vast impact on the development of the platform: using a customisable content management system or designing the platform from scratch was, for instance, an initial choice to be made. While the content management system is easy to install and configure, it lacks the ability to be adjusted to the specific needs of the younger participants of the computer clubs.

For achieving a successful interface design, end-users are incorporated in usability tests in the development process early on. Also over the whole course of the development process, iterative testing with children and their feedback suggestions often provided a basis for discussing suitable design metaphors for the interface. The children from the club in Dortmund and Siegen were usually the first ones to be involved in testing of new versions, since these clubs have the youngest participants. Developing for and with this user group requires special techniques on side of the developers. For instance, the weak reading skills of the young users had to be taken into account and various functions had to be represented by child-appropriate design, i.e. using icons which would allow also users who were not (fully) literate to navigate the platform. This approach helped to create a colorful and child-oriented platform (see Figure 2). Different colors represent different menus for the children: yellow menu items are personal topics (e.g. profile page, pictures, friends), orange menu items display club topics (e.g. clubs' blackboard) and purple menu items represent platform topics (e.g. pin board for everybody). Nearly every week a new version of the design was presented to the children who tried the platform; their feedback and interactions were recorded (audio and the screen capture) and led to another iteration of the design. Additionally, observations from the computer club sessions by tutors and researchers helped us to understand emerging challenges of the platform and informed the design of the next iteration of the platform.

Figure 2: come_NET

Re-occurring privacy concerns and discussions in the club, for instance, regarding children's careless online behavior, raised the demand for easy and adjustable privacy options for come_NET users. Participants should be aware of the security settings of their artifacts and adjust who can see and download them. This concept must be understandable for children. In a first step of the new

development for come_NET, three security levels were created: “for me”, “for us” and “for all”. With these levels the user can adjust if the artifact is visible just for him, for everybody in the club or for every user on the platform. After that a Drag & Drop upload was implemented, where the user can drop any artifact (e.g. games, animations, sound and pictures) in a special area on the website. This procedure of drag & drop is more natural to use for them than the more difficult way through the windows dialog mode: click on the upload-button on the platform, use the windows explorer to search for the picture while navigating through the whole folder structure of the computer and afterwards select the picture and click on the upload button. With a side-wide search it is possible to find visible artifacts and download them. During the next weeks of using the platform participants needed some guidance to explore the new functions and how to use them. Based on these insights two new functions emerged: a playful component, which let the participants interact with each other and a guidance component, which helps new participants explore the platform while solving riddles. These functions were developed in close collaboration with them, every week a new version of the function was prepared and tested with the participants; their feedback was incorporated into the next version of the function.

In the following, we provide a detailed overview about the development of the platform and the design process which led to its different features.

Come_NET Development

The development process consists of four consecutive phases (Figure 3). The first prototype (phase one) was built on a regular content management system (Joomla![2]) with only a few functions (e.g. messaging, profile) based on a requirement analysis which was conducted via interviews in four different computer clubs (Bonn Tannenbusch, Bonn Nordstadt, Dortmund and Siegen). But the content management system had a lot of limitations to adjust the design of the platform and extend the existing functions to meet the requirements of the children (e.g. upload of artifacts).

Therefore, in phase two (Figure 3) come_NET was redesigned and is now based on a PHP framework. In a participatory design process, children from two clubs (Siegen and Bonn Tannenbusch) were involved during the development and provided feedback on a weekly basis: new ideas from the children were implemented (as functioning mock-ups) and evaluated the week after (e.g. messaging, blackboard). This iterative development approach led to a more advanced version, which was tailored to fit the demands of children and parents in come_IN computer clubs.

The following phase 3 and phase 4 extended the existing platform to address issues observed during the weekly sessions by the tutors. In phase three, the goal was to develop a child-oriented artifact exchange; children should be able to upload their artifacts to come_NET as easy as possible. A drag & drop-upload was developed and children in Dortmund and Siegen acted as co-designers informing the look and feel of the implemented feature. The last phase set the objective to let the children get familiar navigating the platform; to achieve this goal a gamification element was designed in an iterative development process: different game concepts were presented to the children and their feedback and new ideas influenced the further development. Detailed bottom-up documentation enables newly arriving developers to come to terms with the system.

[2] http://www.joomla.org

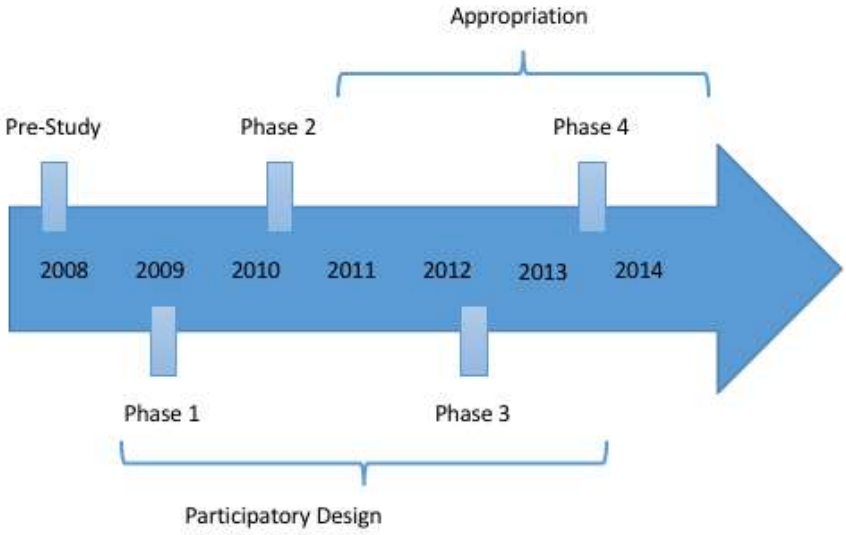

Figure 3: Timeline of the development

Communication

During the iterative development process, children were faced with various design suggestions made by the technical designer to incorporate their feedback as future users. However, occasionally, the designer's ideas were dismissed by the young testers and children's alternative design ideas were taken up instead.

The start page is the entry point to the platform (Figure 2); it shows the latest actions of the participants' friends to create awareness and foster interactions. Participants can see who uploaded new artifacts (e.g. pictures), wrote on the pin board or blackboard, and messaged them. Also they can see which friends have accepted their friendship-requests and they can send a message to the newly acquired friend. The view created provides for friends the opportunity to upload pictures, for individuals to and upload their own original ideas and in general aims at supporting and motivating children to share the different views and projects.

Every club has its own blackboard to communicate inter-club related topics, collect ideas for future projects, talk about current challenges and discuss upcoming events, e.g. the annual computer club trip (Figure 4). Since all children are already attending school the blackboard was chosen as metaphor for this kind of interaction by the designer and approved by the children's feedback. The built-in pin board is a place for short messages and greetings to other members or just the generation of quick idea (Figure 4). Participants used this communication tool to create yellow post-its with their thoughts on it to share them with everybody else.

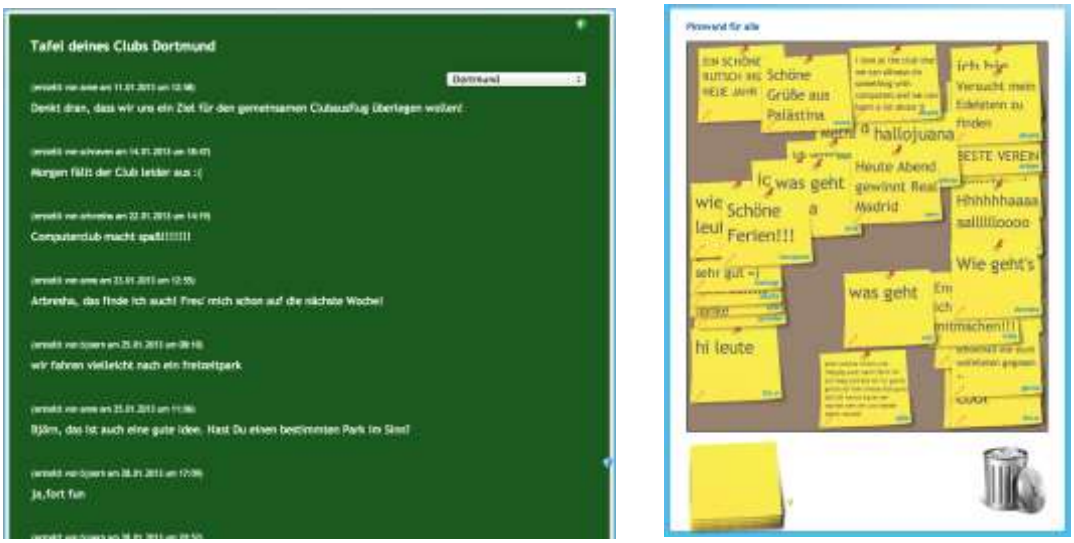

Figure 4: The clubs' blackboard (left) and the pin board (right)

Artifact Sharing

This simplicity works in the upload section for artifacts (Figure 5). The buttons are bigger than usual, have different colors representing the different security levels (based on the overall come_NET-menu) and are simple to handle: a large field with a drag-and-drop option, tempting for creative members to share their self-made projects. This field needs to have a large size since children have limited motor skills; our observations of computer club project-work revealed difficulties in clicking small buttons or using the mouse navigating to a small area. Once uploaded, the artifact is available for the children (e.g. to download it at home) and for other participants of come_NET.

Figure 5: The artifact upload section

To attend to the children's problems in safely storing and locating their project data, as well as to encourage collaboration and the exchange of ideas, a computer club search (Figure 6) is implemented. Here the user can select different data types and artifacts to search (e.g. Scratch projects, videos). Besides browsing the projects of community members, this functionality serves the archiving of past projects, of instructional material and best practice recommendations. Here, the networking and exchange of data is supported, as its purpose in sharing expertise encouraged. The design of the search-function is plain and easy-to-understand - the participant can start a search for a specific artifact with a click on one button; also a time frame for the search can be set. Every button's icon represents a search for either Scratch-projects, pictures, texts, videos, music or all of them; a

search term is not needed at all to start the search. Based on our observations, the vast majority of shared digital projects could be subsumed under those five categories. As our ongoing observations suggested, there was also request for getting inspiration for new projects via the search function. To meet these requests, the search tool allows also 'blind' searches without inputting a keyword, just selecting a file type.

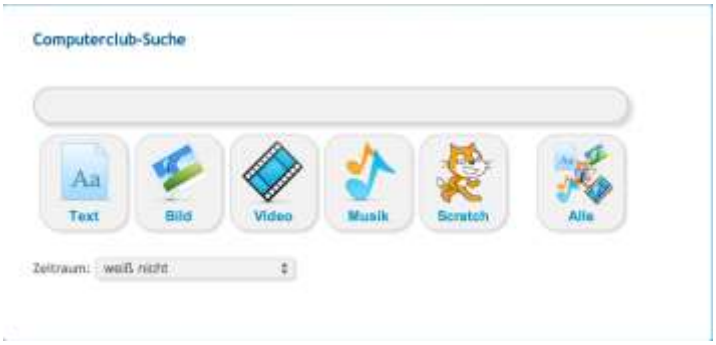

Figure 6: The computer club search

Networking

On the profile page, participants can provide information about themselves for other participants (e.g. where they live, favorite movies, best friends), change their password, play a game about Gems and see with whom they became friends (Figure 7). To complete the profile page was one of the first activities participants did; they spent a lot of time thinking about the different questions they might want to address until they finally found a satisfying answer. Every week participants verified their current answers and modified some of the answers if their preferences changed.

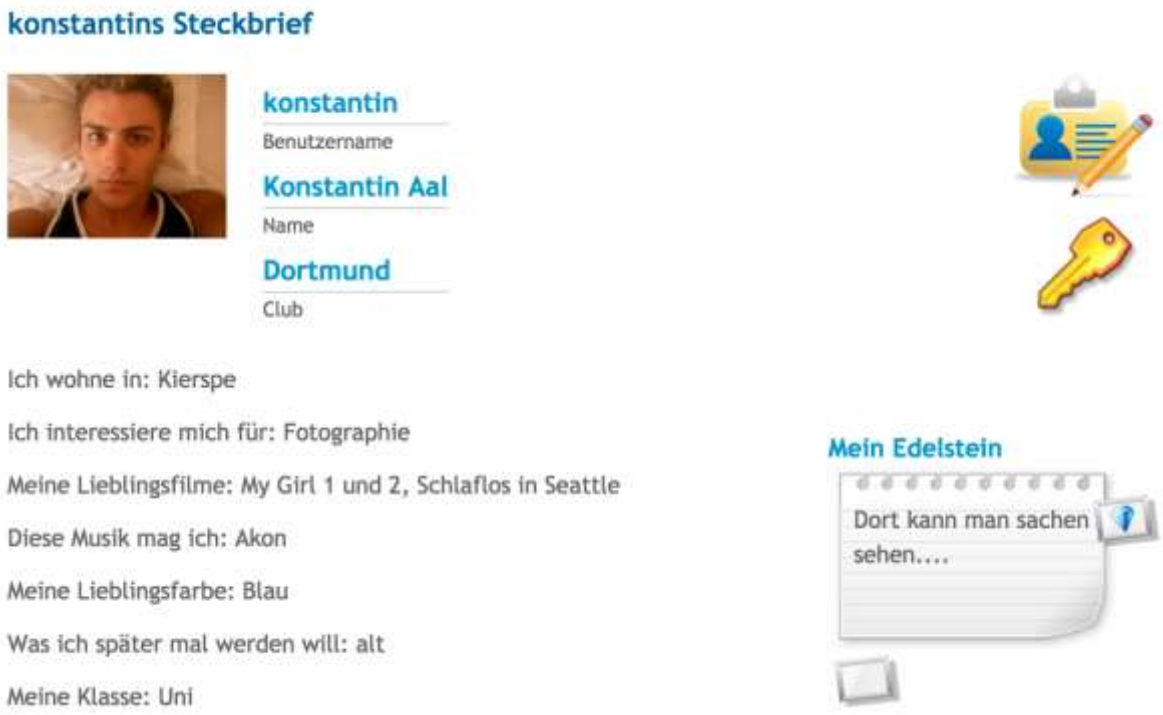

Figure 7: The profile page

The main communication tool for participants was the messaging function. Different icons represent received messages, sent messages, deleted messages or message composition (Figure 8). The size of

all icons was bigger than usual to simplify the usage. Participants could write a message to every other member of come_NET without becoming friends. An auto-complete extension for the username helped to create a message: participants write down the first letters of the name and the extension suggests members whose name start with these letters.

Figure 8: The mailbox for messages

Privacy Settings and Awareness

Privacy was a concern for many parents in the clubs but also for the tutors. It is an important factor that come_NET is a closed platform where only computer club members can participate. That means every participant can obtain an account solely by asking a tutor or the teacher. If a case of harassment happens, the tutors would know the participant and can talk with him privately about the issue.

Figure 9: The artifact upload with privacy settings

The artifact upload is implemented with limited privacy settings for artifacts; three different levels of security are available (see Figure 9):

- “for me” in yellow: the artifact can only be seen by the user who uploaded the artifact, he is the owner. This function can be used to store the artifact on come_NET and download it later at a different place.

- “for us” in orange: the artifact can only be seen by the club where the owner of the artifact is part of. Other club participants can download the artifact and ask the owner in real life question if they want to.
- “for all” in purple: the artifact can be seen by everybody who is part of come_NET. The name and club of the owner is noted on the artifact and other come_NET participants can write him a message if questions occur.

Come_NET aims to raise the awareness for privacy issues by creating a safe environment. Especially for children, the simplicity of the artifact upload helps children to learn the responsible handling of private information and artifacts using an online platform.

Gamification

At the beginning of the come_NET’ usage, participants in the club asked continuously for help to operate the platform. Most of the young users were inexperienced using a social media platform with its several features. To overcome this hurdle and to let the children get familiar with navigating the platform, a gamification feature was implemented (see Figure 10). As our experience from the computer club sessions showed, browser games fascinate children and they never have to be invited to play. Against this backdrop, the gamification element of the platform was developed as a tutorial to motivate the clubs’ participants to explore and make use of the platform on their own. An avatar asks children to fulfill different tasks (e.g. upload your first artifact, send your first friendship request), and while doing so the participants investigate the platform and learn how to use the different functions. After the successful completion of one task, the next task is ready to be addressed. The system also tracks those participants who have already solved the different tasks; if children struggle with their current task, they have a person whom they can ask for help (either by using the platform messaging tool or by communicating in real life).

Figure 10: Gamification Menu

Another element is a gem search game to motivate the participants to use come_NET. Members can search for the gems of other users (see Figure 11). By clicking on them, they can collect these gems, which come in a variety of colors, and they can also set a riddle and choose a color for their own gem when they “hide it” by placing it somewhere on the platform for other users to find.

Figure 11: Collect & Hide Gems

Appropriation of come_NET

come_NET in the club session

Once the online platform come_NET was ready for the clubs to use, it was received in the clubs in different ways, depending on the different needs and prerequisites of the respective clubs.

The computer club in Dortmund absorbed the new platform in a rather lively manner. Children adopted it as an addition that would provide them with entertainment during the initial free time for individual play and work during the club session. After some time, field notes even reported come_NET to have substituted the educational game "Lernwerkstatt" that the children otherwise spent their free time with in the club session completely. "*Can I do the platform now?",* children would immediately demand when entering the computer room, a rather technical wording that may indicate these children's involvement with the development of come_NET. Others would demand: "*I want to do come_NET.*" And still others would seek use of come_NET by naming favorite activity on the platform: "*Let's go on our page and write messages!"* Regularly, the children are seen to engage in writing messages to each other on the platform during club session time. They enjoy writing these, and then watching how their friends in the club receive and read them.

The computer club at the elementary school in Siegen joined come_NET more than a year after it had first been launched for the general use in the clubs. This club in Siegen maintains a very restricted exposure to the Internet, thus its participants did not feel the initial need to engage in come_NET. After the tutors had explained the platform in the club, the participants who were present registered on come_NET, but no activity has been recorded ever since; since there is no particular culture of internet use in this club, the come_NET platform has remained available in the background but is effectively unused. The club is much smaller than the one in Dortmund, fluctuation among the children participants is relatively high, and many of the project activities (e.g. a stop motion film project, or an outdoor photo activity) are offline, not involving the internet.

The elementary school club in Bonn has seen preliminary versions of the platform and children participated in the testing of the platform earlier, but did not engage in the readily launched

platform, because the club was closed at that time due to a fundamental change in the school's after-school-program.

A computer club at a secondary school in Bonn Tannenbusch participated in the development of the platform but did not engage much in its use after the platform was launched. As many of the participating teenagers had already created profile pages on other social media sites such as Facebook, and had developed a regular habit of using those, they considered it interesting to be involved in the development of the platform and thus learn something about the design process first hand. However, they did not see much need to create yet another online profile for themselves. Plus, the come_NET platform lacked features such as online games that the teenagers were used to play with their peers.

The computer club in Kreuztal is affiliated to a secondary school and included in the lower grades' curriculum. Come_NET was introduced in the club's first year, when fifth graders participated in the computer club. The children were granted a quarter of an hour of free online time in the beginning and the regular pattern of usage was to log in to the come_NET platform as soon as the lesson started, and check for new messages that other come_IN members might have sent over the week. The next activity usually was to 'update' the personal profile page, especially the profile picture, not necessarily using pictures of themselves, but rather updating to the 'currently most hyped topic', often resulting in a picture of the latest wish to have smartphone or coolest looking car. Currently, come_NET is used less on a regular basis in the CSG come_IN club in Kreuztal. Contrary to former groups in prior years in this school and other come_IN clubs, the present group of participating children is comparatively older, aged 13-15 years, maintaining individual Facebook profiles etc. already. Therefore, they rated come_NET as lacking several features and elements they were already used to, in particular, online games, and an instant messenger or chat tool. Foremost, the option to be connected to their peers and contacts not related to the come_IN club, was missed, and initially, the closed nature of the platform was not well received among all. However, former participants in this club appreciated this "parent approved" online community, especially for its message function.

The annual joint come_IN excursion (called '*Aktionstag*') triggered the use of come_NET more noticeably, as children from different clubs contacted each other in come_NET after they had met in person at the event. Field notes report, how the children engaged in writing messages to the children they had met at the joint gathering, and how the writing and receiving of these messages were accompanied by giggles and laughter, whenever the communication went across genders. Otherwise, there had not been any forms of cooperation among the different clubs before.

In the clubs, the platform was not yet used as a tool for collaboration. This is mainly due to the fact that until now no project activities have been conducted that reached beyond a single club .

As a consequence of the above described computer club structure and platform appropriation, our subsequent presentation of the usage of the different platform features focuses mainly on the computer clubs in Dortmund and Kreuztal. These two clubs mainly engaged in using the platform after its launch.

Artifact Sharing

By the time the platform was introduced to the club in Dortmund, participants had completed a number of project activities using MIT's programming environment, Scratch. Accordingly, the first projects that the children uploaded to their profiles in come_NET were Scratch projects that they had

completed. However, this did not result in major data sharing on the side of the children. Rather, sharing activities occurred directly linked to the actual production process, e.g. when one child in the club was seen to create a new project in Scratch, another child observed this, was impressed by a detail of its design or programming logic, and would then ask for permission to use this in a project of his or her own. Almost always, this resulted, not in the sharing of actual artifacts, but rather in the sharing of the knowledge about how to make them. The children preferred to create something of their own, so their main interest was in the knowledge of the production process, rather than on re-using someone else's creation.

In the club in Kreuztal, only on rare occasions was come_NET used to share user created content. In most cases, the shared artifacts were Scratch projects, which were uploaded just for testing, to explore how the sharing works, and, in some cases, after tutors encouraged participating children to "*share their cool project also with the other clubs*", but usually not as a result of any personal incentive of the children. This may be due to the fact that online sharing at that time and at their age was not as common a practice as it seems to have become today, with messenger services like WhatsApp[3] and numerous smart phone applications used also by children.

Communication

Children in the club in Dortmund initially liked the message feature of come_NET. They enjoyed writing messages with their friends. Surprisingly, they were mainly engaging with this during club time, writing messages to other children in the club. Since these were often sitting at the computer right next to them, the children were frequently seen to turn their computer screens and keyboards, typing in rather awkward positions, so their friends would not be able to see the message before it was sent. Also – once the message was ready and sent – children were frequently seen to run across the room to the computer of the child that was the receiver of the message.

Child 1: *"Did you get my message?"*
Child 2 (engaged in something else): *"No?"*
Child 1: *"Quick! Have a look! I sent it just now!"*

In the computer club in Kreuztal, the text chat tool was used in the main for instant- messaging other peers in the same computer club location, posting ideas and questions, broadcasting updates on current activity, informing others to check self-created come_NET content, such as black board entries or profile changes. This way, allowing communication while pursuing project work activities, not losing time and track for leaving the own computer and current activity.

It may appear trivial, but as the time per week is usually limited to just one and a half hours, children in the club in Bonn Marienschule, as well as in Dortmund, were often observed to avoid the slightest delay in their project work and any slowdown 'caused by others', e.g. when a tutor could not solve a hardware issue immediately, resulted in harsh criticism for: "Losing track of the others' project progress" (rather losing the 'leading developer' role).

Networking

In Dortmund, come_NET was initially received as an ideal instrument for children who had left elementary school and, with it, the computer club; to still keep in contact with their peers from the

[3] https://www.whatsapp.com/

computer club. Several children also wrote messages to teacher and tutors in the club, asking about project activities and whether they could visit the club again.

Also, the club's blackboard turned out to be an important feature for networking. Children would post messages there outside of club times, greeting others, and trying to prompt responses from other children in their club.

Inter-club networking was noticeably triggered by the joint excursions of the clubs. After returning from a joint trip to a working world exhibition, the event was addressed on the come_NET platform in various ways. For instance, the shared experience was used afterwards as a common reference, e.g. in the description of the gems, which should hint to the respective stash in form of a riddle: "*My gem is nearby a girl that was in my group at DASA Dortmund*".

Privacy Settings and Awareness

Awareness for privacy settings was fostered in the club in Dortmund in close relation to the Upload and Sharing option in come_NET. While at first, children did not really spend much time on thinking whether they wanted the upload of an artifact to be "for me", "for us", or "for all", over time, this became an issue, and children were seen to discuss with their best friends in the club whether the artifact they wanted to upload was of shareable quality.

This awareness of privacy settings was further deepened, when one of the girls in the computer club lost her account password and it was used by an unknown person in her name. After this, the club held a special session on password security and privacy online, where the children, teacher and tutor jointly discussed the topic and developed guiding principles for the children to keep in mind (e.g. asking whether everyone in the club network should know one's personal address, see personal pictures, or if one's best friend should know login data).

Since data sharing via come_NET did not constitute a regular practice in Kreuztal, children in this Club were not much concerned with the available privacy settings. On the rare occasions the sharing function was utilized, sharing was always meant as publishing a project to as big as possible an audience, therefore always setting the sharing option to "for all".

Gamification

All children in Dortmund were seemed especially entertained by searching for images to upload on their profile pages on the platform. To them, this was a playful way of getting to know the features of the platform and to individualize their own appearance in it.

Gamification elements were well appreciated in the Computer Club at the comprehensive school in Kreuztal as well, just as much by the older participants. For instance, one of the implemented gamification elements let players hide and seek little gem icons on the come_NET pages, triggering usage with notifications on who found the hidden gems. Older kids, around the age of 13, were observed laughing and making fun of engaging in these 'childish' hide and seek activities but, nevertheless, engaging in this activity regularly. One of the reasons for that may be the fact that gems "hidden" on one's personal profile page would be easily noticed by the respective page owner and just by clicking, the page could be "cleaned". Also, some children tried getting a huge collection of gems (found gems would be displayed in a nice collection on the profile page), others were eager to find the best stash for the little gem icons, e.g. on the site notice page, which rarely any children would access.

Discussion

The online community platform come_NET has been in use in the computer club network for more than a year now, and our detailed analysis of the reception of its features in the club routines in the various clubs reveals three main factors determining a sustainable implementation. These are 1) a reliable *social structure* within the club and beyond, 2) a close structural connection to, and awareness of, the general *(social) media and computer use habits* of the prospective child and youth users, and 3) the employment of *gamification* to motivate usage.

Social Setting

Since come_NET is an online platform designed to support the offline activity of computer clubs, it showed that a dependable social setting within the club as well as beyond was an important prerequisite for a lively usage of come_NET. Platform usage in the computer club in Dortmund illustrates this – here strong friendship ties had already developed among the children in the club, and come_NET bore features (e.g. messaging) that were able to support and intensify these online. Indicative of this might also be the fact that computer club alumni greeted the platform as a means to stay in contact with 'their' club after they had left elementary school, and come to visit whenever possible.

Interacting with given IT Infrastructures

Especially among the older children and youth participants in our computer clubs, there was relatively little interest in engaging in platform usage and maintaining an account there. Especially among the youth computer club participants, this was attributable to general social media and computer use habits: most of the girls and boys already kept Facebook accounts and engaged in the use of instant messaging services like WhatsApp, so the closed, intra-net like appearance of come_NET was of little appeal to them. This finding supports earlier work by of Pipek and Wulf [23], showing how "the strength of use patterns coined in practice and conventions may equal the strength of use patterns enforced through technology" (ibid. p.466). Among the younger children, who were not yet 'settled' with regard to their use habits of social media and related computer technology, come_NET bore features that were obviously of great interest to the children – most prominently among them the messaging feature, as well as photo-related features like the possibility to create albums with favorite images and the option to personalize the account with a profile picture.

It became apparent, that whenever come_NET was able to create a close connection to these general social media and computer use practices of the children and youth participants in the computer clubs, this resulted in a lively and sustainable platform usage. This also included elements of guidance, e.g. with regard to privacy and an awareness for data security and sharing online, as could be seen in the club in Dortmund when a special session on password security was held in the club after one of the girls had lost her password, as we have seen. Here, it was the social setting of the club that allowed for a safe and thus sustainable reception of the online platform: the guidance by tutors and the teacher as well as guiding features implemented (e.g. explanations about what makes for a safe password) made the children feel secure – there was always the upcoming club session as a place where lost passwords could be restored, and insecurities, e.g. in the managing of personal data in account profiles, could be discussed and fixed. This falls in line with insights of Ahn et al [3] on how social media and sharing tools can contribute to child learning. In line with Revelle et al's work on prosocial media for children [27], the platform was seen to be capable of triggering

creativity and the exchange of knowledge, e.g. when children in the club in Dortmund w exchanged knowledge about the creation of a specific artefact rather than sharing and re-using the artefacts themselves.

Gamification

The computer club is decidedly separate from conventional school activities, offering guidance but not teaching in a traditional manner. The design of come_NET follows this open, yet guiding structure with elements of gamification, triggering usage among the child participants in the computer clubs. Overall, the elements like the hide-and-seek game with little gems as well as the guiding quiz element with the cartoon character, 'Lucas', showed promise in that they triggered playful exploration of the platform among the younger children and even entertained the more media-experienced youth participants in the computer clubs.

Conclusion

The younger participants in the come_IN computer clubs were not used to maintaining a personal online appearance in form of a website or a personal profile in an online social community. Their parents sometimes exhibited reservations regarding their children's engagement in openly accessible online communities. Against this backdrop, the closed, online community platform come_NET was well received by children and parents, and teachers alike. The participatory design process, closely involving the participants in the computer clubs and paying special attention to the needs of the children fostered a profound understanding of the platform structure and its functionalities. It thus initialized trust and supported the appropriation of the platform among the computer club participants. Especially the younger children were able to benefit, as the platform enabled them to gather experience as users of social media, but in a safe and guided manner. However, the intranet-like structure of come_NET entailed limitations to its targeted user group: come_NET was found not to be appealing to teenagers, who had already gathered some experience as social media users and preferred engaging in open communities.

Future work will involve the extension of the come_NET platform to newly established computer clubs in Palestine [1]. This will potentially trigger international collaborations among come_IN clubs as well as increased application of come_NET, leading to redesign and new features eventually.

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