Mobile Learning with Smartphones

Integrating Handheld Devices into the Everyday Fabric of Schools

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Erklärung zur Verfassung der Arbeit

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Acknowledgements

Abstract

Smartphones have become far more than tools of mobile communication in everyday life. These multipurpose devices can be used to lose weight, and/or to quit smoking. Thanks to its internet connection and world of apps, the smartphone has become a frequently used part of everybody's life. Easing everyday life e.g. when looking up the schedules of public transport and/or routing through the traffic. Since mobile computing has improved tremendously in the last decade, the scope of smartphones has become wide ranging. Thus smartphones could be also considered to be used for educational software solutions to overcome given barriers of *deskbound* computers.

In terms of educational software solutions for smartphones, the aim of this thesis is to explore ideas about possibilities for educational smartphone usage in schools. A special focus has been given to school educationalists as they have the power to introduce such devices in their education. According to teachers it is necessary to understand their general attitudes towards technology appliance at schools. Furthermore we need to investigate about their technological knowhow and motivation to use mobile devices in everyday school life. Thereby it is necessary to talk with teachers and educationalists in order to discuss their concerns and doubts on mobile devices. Therefore emphasis is given on the collaborative work with teachers to define ways to adopt smartphones within a well defined curriculum.

Furthermore, ideas to gain smartphone practices in the course of school subjects are developed to improve learning and teaching experiences at school. Apart from that, embodied learning experiences with smartphones for learning outdoor school excursions are dealt with.

Concerning all these points I rely on the analysed results of our qualitative interviews conducted with teachers at primary school St. Elisatbethplatz, Vienna.

The design of educational applications for mobile devices was performed and discussed with primary school aged children of the same institution. Based on the outcomes of participatory design sessions with children, ideas for educational mobile applications are analysed. In addition children's approaches to smartphone usage in their daily lives is investigated and their motivation to use smartphones for learning content in school is discussed.

Moreover children's social interaction during the workshops and the challenges of working with children as design partners throughout this study are mentioned.

Finally the outcomes of qualitative research methodologies which were applied within this thesis are discussed. Thereby teacher's suggestions on co-work with school book publishing are pointed out in order to develop pedagogically desired mobile learning applications for schools that can have a worthwhile appliance within a well defined

curriculum. Thus teacher's views on mobile learning applications as training programs are mentioned in order to improve children's skills in mathematics, german spelling or english vocabulary. Apart from that mobile learning programs with a playful learning approach are recommended as supportive tools for *Digital Game Based Learning* (Prensky 2005) and *Incidental Learning* (Schank, Cleary 1995). In addition a special emphasize is given on teacher's need for a *Mobile Learning Framework* that specifies the usage of mobile devices and defines *where*, *when* and *what for* mobile technologies are used in schools. Thereby teacher's demand for a standardized device with same attributes is named in order to provide all children equal learning experiences and enable teachers the possibility for monitoring and control. As a conclusion examples of children's design sheets with ideas on mobile learning applications are introduced and their overall motivation to use smartphones for learning in school is discussed.

Kurzfassung

Smartphones sind zu weitaus mehr als Tools für mobile Kommunikation im Alltag geworden. Diese Geräte können zu mehreren Zwecken verwendet werden um abzunehmen und/oder mit dem Rauchen aufzuhören. Dank Internetverbindung und unzähligen Apps sind Smartphones im täglichen Leben häufig in Verwendung. Es ist eine Erleichterung des Alltags um Fahrpläne der öffentlichen Verkehrsmittel nachzusehen und/oder Strecken im Verkehrsplan zu planen. Seit der enormen Entwicklung von Mobile Computing im letzten Jahrzehnt, besteht ein breitgefächerter Anwendungsbereich von Smartphones. Somit könnte der Gebrauch von Smartphones auch für pädagogische Softwarelösungen in Betracht gezogen werden um gegebene Hindernisse von *deskbound* Computern zu überwinden.

Diesbezüglich ist es das Ziel dieser Diplomarbeit, Ideen zu Möglichkeiten für die Verwendung von Smartphones im Bildungsbereich zu erforschen. Was die Benutzung von Smartphones an Schulen angeht, haben Lehrkräfte ein großes Wort mitzureden. Deshalb ist es notwendig, sich ein Bild zu machen über Ihre allgemeine Einstellung und technologischem Knowhow, sowie Ihrer Motivation bezüglich der Verwendung von mobilen Geräten im Schulalltag. Demnach wird das gemeinsame Gespräch zu LehrerInnen und Pädagogen/Pädagoginnen gesucht um Ihre Anliegen und Zweifel zu mobilen Geräten zu diskutieren. Auf die Zusammenarbeit mit Lehrkräften wird ein großer Wert gelegt um Art und Weise zu definieren, wie Smartphones in einem festgelegten Lehrplan verwendet werden könnten.

Desweiteren werden Ideen entwickelt, um Smartphonepraxis im Zuge von Unterrichtsfächern zu sammeln und das Lernen sowie Lehren in der Schule zu verbessern. Zudem werden Lernerfahrungen mit Smartphones auch außerhalb der Schule, auf Lehrausgängen behandelt.

Alle genannten Vorhaben werden sich auf die Analyse der Ergebnisse von qualitativen Interviews mit LehrerInnen der Volksschule St.Elisabethplatz in Wien beziehen.

Der Entwurf pädagogischer Lernapplikationen wird mit Volksschulkindern derselben Anstalt durchgeführt und diskutiert. Anhand der Ergebnisse welche während den Participatory Design Sitzungen mit den Kindern erzielt wurden, werden Ideen für mobile pädagogische Applikationen analysiert. Außerdem wird die Benutzung von Smartphones im alltäglichen Leben der Kinder untersucht. Mit diesem Ansatz wird ihre Motivation diese Geräte im Schullalltag zu verwenden, diskutiert.

Darüber hinaus wird die soziale Interaktion der Kinder während des Workshops und Herausforderungen bei der Zusammenarbeit mit Kindern als Designpartner behandelt.

Zum Abschluss werden die Ergebnisse der an dieser Diplomarbeit angewendeten qualitativen Forschungsmethoden diskutiert. Dabei wird auf den Vorschlag der Lehrkräfte bezüglich einer Zusammenarbeit mit Schulbuchverlagen hingewiesen, um pädagogische mobile Lernapplikationen für Schulen zu entwickeln, die im Zuge eines Lehrplans sinnvoll eingesetz werden können.

Somit werden mobile Lernapplikationen von Lehrkräften als Übungsprogramme betrachtet, um die Fähigkeiten von Kindern in Mathetmatik, Deutsch und Englisch zu verbessern. Außerdem werden mobile Lernprogramme mit spielerischem Lernansatz vorgeschlagen die als unterstützende Tools für *Digital Game Based Learning* (Prensky 2005) und *Incidental Learning* (Schank, Cleary 1995) gelten. Zusätzlich wird ein großer Wert auf die Notwendigkeit von einem *Mobile Learning Framework* seitens Lehrerinnen gelegt, welches die spezifische Verwendung von mobilen Geräten angibt und definiert *wo*, *wann* und *wofür* mobile Technologien im Schulalltag verwendet werden können. Dabei wird die Nachfrage der Lehrerinnen nach einem standardisierten Gerät mit gleichen Attributen genannt um allen Kindern gleiche Lernerfahrungen zu bieten und Lehrkräften die Möglichkeit einer Kontrolle der Verwendung von mobilen Geräten im Klassenzimmer zu gewährleisten. Abschließend werden einige Beispiele der Designdokumente von Kindern vorgestellt, die Ideen zu mobilen Lernprogrammen beinhalten. Desweiteren wird die allgemeine Motivation von Kindern bezüglich der Verwendung von Smartphones in der Schule diskutiert.

Contents

1 Introduction

1.1 Motivation

My motivation to address this topic in my master thesis was inspired by a course I joined in the previous semester at the Human Computer Interaction Group of the Vienna University of Technology, called: *187.A22 Theories and Methods for Multimedia Systems Design.* At this course I realized the importance of user studies in building technological items for human usage. Therefore I decided to conduct a similar study for my master thesis where I could practice what I had learned in the field of human computer interaction. The idea of working with children when designing technology for them arose mainly from my personal interest and was improved with the great support of my advisor. Previous research with children has been made determining the rule of children as design partners (Druin 2002) and explaining the importance of children being actively involved into the design of new technology (Druin et al. 1998, Druin 1999, Druin 2002; Walsh, Druin et al. 2010).

As smartphones are a recent technology used in everyday life (Barkhuus, Polichar 2010, Trinh Minh Tri Do et al. 2011), I realized that I wanted to conduct a user study about designing smartphone applications for children. A more focused research topic came through reading research papers and past research in the field of mobile learning in education (Soloway et al. 2001; Roschelle 2003; Ratto et al. 2003; Rogers, Price, Fitzpatrick et al. 2004; Luckin, Du Boulay, Smith, Underwood, Fitzpatrick et al. 2005; Halloran, Hornecker, Fitzpatrick 2006; Frohberg 2006; Göth, Frohberg, Schwabe 2006; Hartnell-Young 2008,). Previous research with handheld devices in schools has revealed a lot of challenges of integrating mobile devices into the everyday fabric of schools, from educator's doubts (Soloway et al. 2001) and resistance to use handheld devices in the classroom (Hartnell-Young 2008), to the lack of current curriculums only applicable for software on PC labs (Hartnell-Young 2008) and the focus problem of mobile learning, where still different design metaphors for mobile applications are needed (Göth et al., 2006). However a lot of mobile learning projects have been developed for schools that ensure the benefits of mobile technology, facilitating teaching for educators, encouraging children to participate actively in group collaborations (Liu et al., 2003), enhancing children's learning experiences (Roschelle 2003, Ratto et al., 2003) and enabling seamless learning (Barkhuus, Polichar 2010) in different learning environments, in the field and in classroom settings (Luckin, Du Boulay, Smith, Underwood and Fitzpatrick et al., 2005).

All these aspects motivated me to choose this topic for my master thesis, to address recent challenges in terms of mobile learning with smartphones in schools.

1.2 Problem Statement

Challenges to integrate handheld devices into the everyday fabric of schools have been investigated in earlier years (Soloway et al., 2001, Roschelle, 2003).

Nowadays there is very low usage of smartphones in classes, mainly because of the existing curriculum, which mainly covers software related education in PC labs (Hartnell-Young, 2008).

To get the acceptance of mobile learning technologies such as smartphones or handhelds in schools the following requirements must be accomplished:

First of all mobile learning devices and applications are needed to be appropriate to meet the pedagogical requirements and desires of teachers (Roschelle 2003). Furthermore educators are needed to be motivated to use smartphones for educational purposes in schools (Soloway et al., 2001) in order to achieve a large scale distribution and impact of mobile learning devices (Roschelle 2003).

Second, the curriculum must be adapted to make these devices attractive for teachers with applications that support a range of learning activities (Soloway et al., 2001). In that way students can concentrate on learning themselves, moreover they are encouraged to contribute actively in class discussions, whereas teachers can concentrate on teaching and ease the learning activity in a crowded classroom with the use of many mobile learning applications such as classroom response systems (Roschelle 2003).

Third, governments have written policies, these are significant to define the curriculum. However in Austria schools have established own policies to determine the use of mobile phones and smartphones in educational institutions, or to permit the use in classrooms. Concerning that point mobile phones are accepted as devices for social usage rather than for educational learning context (Hartnell-Young, 2008). So far integrating mobile learning technology into the everyday fabric of a classroom is a challenge, while educators are also feeling pressures to use those (Soloway et al., 2001). The amount of technology used in the classroom depends on the teacher's technological knowhow, confidence and attitude towards risk taking (Hartnell-Young, 2008). However, Hartnell-Young (2008) is convinced that the use of mobile phones can be adopted in classrooms as soon as teachers can be encouraged to use them. Therefore teachers play a decisive role to permit mobile technology usage in schools. They need to realise the necessity of mobile phones in schools and see the whole new bunch of perspectives.

Nevertheless, Göth, Frohberg and Schwabe (2006) describe the focus problem in mobile learning with the domination of technology that prevents learners to interact with the environment. However they indicate the aim of mobile learning devices to enrich the learning environment and allow interaction with the tangibility and embodiment of mobile devices. Thus the design of applications for mobile devices is needed to be done with a different metaphor than computer devices which are deskbound and allow only limited interaction with the environment.

Since mobile phones have always been essential devices in socialising efforts students cannot directly associate mobile phone usage with learning content in school. For that reason students tend to see their mobile phones as social tools rather than tools for learning (Hartnell-Young, 2008). In contrast, the fact of mobile phones applied in social context can be a beneficial advantage too, enabling personalized learning and ownership of mobile devices. Hence, previous research has proved that teachers promote the use of real smartphones instead of PDAs, just because the use of smartphones is already integrated in the life of children (Hartnell-Young, 2008). Teachers emphasize on the benefit of children owning smartphones and using their personalized devices in social as well as school life. (Hartnell-Young, 2008). Luckin, Boulay, Smith, Underwood and Fitzpatrick et al. (2005) support the idea of using personalized mobile computing devices to enable children a wider learning experience in different learning contexts and scenarios. Their work has shown that children can link their learning tasks across multiple locations with a smooth flow between school and homework. This makes the organization of learning tasks more comfortable, but also enables assessment centered learning and gives parents direct access to children's schoolwork. But the possible dependency between shifting costs and ownership must be considered when using personalized mobile devices for learning context. Usually schools get financial support for computer labs in schools. As soon as children's personal smartphones would be used in school for mobile learning activities, shifting costs could be a burden to children's families and the children themselves (Hartnell-Young, 2008).

Frohberg, Göth and Schwabe (2009) have evaluated today's mobile learning projects. Their review indicates mobile learning projects in physical context as the most innovative ones. Hence there are a lot of past and current projects in this area, such as the Ambient Wood project of Rogers, Price and Fitzpatrick et al. (2004).

Frohberg et al. (2009) recommend further research in the area of physical context. Frohberg (2006) also suggests that mobile applications for educational purposes in primary schools can be applied within the formalized, digital and physical context. Frohberg (2006) also states that digital context can also be expanded by physical context to enlarge the learning experience and add more knowledge to the area of mobile learning.

Finally Hartnell-Young (2008) has stated that firstly schools need to identify how any technological mobile devices can help students to achieve their goals for learning and secondly that appropriate models of ownership for mobile devices are needed to be developed.

All these requirements are of relevance when the integration of mobile devices should be an issue of technology enhanced learning in schools. However technology has changed with the recent emergence of smart phones technology and new standards in ICT have emerged since early research in the field of mobile learning. Further work has to be done based on these evaluations with today's technological possibilities. The advantage of using smartphones as personalized devices (Hartnell-Young 2008) resolving the barriers of having limited access to technology inside the classroom (Soloway et al.; 2001) indicates that future research in this area is needed. The work of Luckin, Du Boulay, Smith, Underwood and Fitzpatrick et al. (2005) shows how mobile devices such as tablet PCs enable a seamless transition between different learning environments as schools and homes. Previous research is representing groundwork for working with smartphones where seamlessness can be experienced right in the palm of our hands (Barkhuus, Polichar 2010) and develop applications for mobile learning

in schools with new appropriate pedagogical metaphors. Smartphones have become powerful devices enabling users to work with different functionalities to enhance children's learning experiences. However it is necessary to understand teacher's pressures (Soloway et al. 2001), doubts and resistance to use smartphones in schools (Hartnell-Young 2008), as these devices can cause disruptive behaviour like cheating or downloading inappropriate content.

1.3 Research Questions

The aim of this work is to address the barriers of mobile learning in schools and to explore ideas about possibilities to institutionalize the use of smartphones for technology mediated ubiquitous learning in schools. Thus answers to the following research questions will be given:

1. What are the ways to adopt smartphones for learning context within a well - defined curriculum? This part of the study addresses the lack of mobile technology usage in curriculums. Therefore the main aim is to examine possibilities referring to the problem of deskbound learning in PC labs (Soloway et al., 2001) and enable children to interact with their physical environment by using different metaphors for handheld mobile applications from PC software (Göth, Frohberg, Schwabe 2006), allowing them to combine their learning experiences in different places, inside and outside the classroom (Luckin, Boulay, Smith, Underwood and Fitzpatrick et al. (2005), Rogers, Price and Fitzpatrick et al., 2004), furthermore to apply mobile technology inside the classroom for mobile learning projects with individuals and groups (Roschelle and Pear 2002). Data will be collected through qualitative interviews with teachers and children's educationalists.

2. What are significant points for teachers to get their acceptance for integrating mobile learning technologies in schools? In this section teachers are the main contributors as adult researchers. All data will be collected through qualitative interviews. The main achievement is to identify how any mobile technologies and applications are needed (Hartnell-Young 2008) and to indicate teacher's pressures (Soloway et al., 2001), anxieties and doubts on mobile learning, as well as to find out how these barriers can be resolved through the development of a framework related to mobile learning in the classroom. With this framework technology enhanced learning with mobile devices should be permitted in elementary schools and smartphones should be integrated for educational purposes into the everyday fabric of schools (Soloway et al., 2001, Roschelle, 2003).

3. How can pedagogically desired applications be designed? Concerning that point, the goal is to suggest mobile applications that can be actively used in the classroom and shape children's and teacher's learning and teaching experiences (Roschelle 2003, Ratto et al., 2003), providing children easy review of information, entering and comparison of data (Druin 2009), embodied tangibility (Göth, Frohberg and Schwabe 2006, Frohberg 2006) while they are involved in foregrounded physical activities and learning outdoor such as the *Ambient Wood project* (Rogers, Price and Fitzpatrick et al., 2004), as well as assisted learning with notifications and regular reminders sent from teachers to children's devices (Hartnell-Young 2008). On the other hand teachers will be able to educate within a knowledge and learner - centered classroom (Roschelle 2003). Data collection will be done with Participatory Design sessions and brainstorming with children and teachers (Druin 2002), Contextual Inquiry observation techniques with children (Druin et al., 1998) to get a better understanding of their

experiences with mobile phones and to find out ways to resolve barriers of mobile phones as tools only associated in social context (Hartnell-Young, 2008).

Throughout this study special care will be given on ethical issues as these are necessary to work with young elementary school children and teachers. Therefore the following steps will be accomplished: Work will be conducted at the primary school St. Elisabethplatz, Vienna. First of all a permission of the school principal Dipl. Päd. Brigitte Danhel will be taken. A further request to conduct this study will be made to the school inspector of the city Vienna (*Stadschulrat Wien*). Furthermore parents of the children will receive an information sheet and a consent form to indicate their willingness for their children to participate in this study. Another information sheet and consent form is prepared for teachers. The consent form and information sheets for parents and teachers can be found within the enclosed CD-ROM.

1.4 Methodological Approach

To provide answers to all of my research questions, qualitative interviews with teachers and children's educationalists at primary school St. Elisabethplatz, Vienna will be made. In addition children will be taken as design partners playing an active role in the design process and letting them know that they make a difference in changing technology, since children have different likes, dislikes and needs than adults. (Druin et al., 1998, Druin 2002). The involvement of children as design partners in a research project has its roots in Cooperative Inquiry and is essential when researchers are developing technology for children (Druin 1999). In that way we can get a better understanding of children's needs and experiences with technology.

Pedagogically desired applications will be designed both with teachers as adult researchers - of course this can be empowering for them since they will realize their active role in technology development - and kids as child researchers (Druin 2002). Additional brainstorming techniques to involve children in the initial brainstorming process (Druin 2002) will be used in participatory design sessions held with children allowing designers to sketch their ideas. Each session will be held with third and fourth grade elementary school children at the same institution and teachers with groups of 6-8 participants. Engagement with adults and children will be carried out collaboratively in the same sessions. In case if there are not enough teachers to participate, the sessions will be carried out with child participants only. Apart from that child participants will be both mobile phone/ smartphone users and no phone users. Additional observation techniques of Contextual Inquiry (Druin et al., 1998) will be used where children will be observed to analyze their general practices with mobile phones. A better understanding of children's use of technology in the classroom will be given, when children will be asked to show and use their mobile phone. Furthermore children will be asked questions about how they could imagine using their phones in school to support their learning experience. In that way children will be observed in their typical learning environment in school. Informal clothing will be worn to represent less of an authority figure (Druin 2002).

Possible challenges might arise throughout the collaborative work with children and their teachers. As suggested by Druin (2002) teacher's old habits will be challenged as such they should partner and not teach their team members during the design sessions. Apart from that teachers will be asked to spend their own time in class to collect data for this research study; however Druin (2002) also mentions that it is in some cases of advantage to work in schools.

1.5   Structure of the work

Chapter 2 gives an introduction to previous researches with mobile devices in everyday life. Foremost it critically discusses examples of past findings in the field of mobile learning with handheld devices. Apart from that experiences of former studies with children as design partners are taken as an input within this thesis.

Chapter 3 provides information to ethical and organizational issues of qualitative research methodologies that are conducted within this thesis.

Chapter 4 evaluates the outcomes of qualitative interviews with teachers and children's educationalists. Furthermore teacher's technological knowhow and their overall motivation to use smartphones for mobile learning in schools is discussed. Apart from that teacher's concerns and prejudices on technology appliance in schools is recognized in order to understand their needs on mobile learning. Finally teacher's suggestions for a mobile learning framework are introduced in order to adopt a worthwhile usage of mobile devices for educational context in schools.

Chapter 5 analyses the findings of participatory design with children. It primarily introduces interesting examples of children's design sheets with their ideas for mobile learning applications. Furthermore children's interaction in the social fabric of schools and their embodiment with mobile devices is observed in order to understand their user habits and the way they use smartphones or mobile phones in their everyday lives. As a result children's overall motivation to use smartphones in schools for learning content is discussed.

Chapter 6 gives a review of the final outcome of my research methodologies.

Chapter 7 summarizes the work within this thesis and provides suggestions for future work.

2 State of the art

This chapter gives a critical introduction to past researches in the field of mobile devices used in everyday life, as well as the appliance of handheld devices for educational purposes. The possibilities and advantages of using mobile devices in our daily lives will be presented in some recognized studies. Apart from that, significant findings and experiences of previous research projects in the course of mobile learning will be underlined to identify the gaps of mobile learning in schools. Well known mobile learning applications, classified in a framework for mobile learning, will be explained and questioned for having an influence on designing new mobile learning applications for smartphones. Previous implementations of mobile learning projects will be implicated for this research project as well.

2.1 Mobile Devices in Everyday Life

Today smartphones have become essential devices in our lives. This powerful technology opens up new perspectives and enables users to be connected and accessible everywhere at anytime.

Numerous research studies have been made about the general use of mobile personal devices. Barkhuus and Polichar (2010) have focused on adult people's everyday practices with smartphones and emphasized on the importance of such multifunctional devices, which enables people to use their devices in individual manners and create their own portfolio of functionalities. They tried to find out with interviews and diary studies the way adults are using their mobile phones in order to meet their daily needs. They also suggested that computing became centralized and easily accessible right in the palm of your hand. The flexibility for messaging via texting (email, sms, social networking) and voice call allows people to be reachable in different ways by different individuals and respond in a manner appropriate to the circumstances. Applications from App Store's are the latest innovation to enable user specified downloads and arrange individual usage. The smartphone is also a possibility to manage work life balance easily. But most of all Barkhuus and Polichar (2010) emphasized in the seamlessness of smartphone usage that integrates many functionalities within a single device.

Trinh Minh Tri Do et al. (2011) have looked at contextualized smart phone usage of adults in real life. The study took place in Switzerland over nine months with 77 participants, whereas data collection was gained through a server-client framework build in on *Nokia N95 8GB* smartphone devices. Thereby they defined an ecosystem of functions, applications and services enabled by smartphones and placed end users at the center of such a system. The study stated that both physical and social contexts are crucial factors for the way smartphones are used and what kinds of applications are popular among adult people. Barkhuus and Polichar (2010) have also found out that people are prepared to make compromises in their habits of smartphone usage and adapt their behaviour in a given physical space. However

Barkhuus and Polichar (2010) also suggest that it is a challenge for user centered design to predict what kind of technology people would prefer in different situations since the variety of ways how people approach a task is a big deal.

All these studies have investigated adult peoples' daily practices with smartphones and their preferences of mobile applications for communication and entertainment. It is interesting to know young children's understanding of technology and their experiences with the latest commercial technologies. Smartphones have become popular devices in that area hence it is interesting to know what kind of applications children prefer to use in their lives.

2.2   Mobile Devices in Education

„Mobile technologies can help advance the goal of achieving digital equity because of their ubiquity, low cost, and familiarity. The anytime, anywhere availability of mobile devices also has potential to promote a seamless 360-degree learning experience that breaks down the barriers between formal and informal educational environments." (Druin 2009)

Nowadays mobile technologies are shaping our lifestyle in a way they enable us to experience our daily activities on the road with the possibility of being reachable everywhere at anytime. Handheld devices such as smartphones or tablets are in widespread use applied for communication, organization and entertainment. Besides deskbound computers children have gained experiences with mobile devices too. Children use their mobile phones to surf on the internet, communicate with social networking applications as well as content creation and distribution. They like to record videos and make photos which they can upload on *Youtube* or share with their friends on *Facebook*. These characteristics of mobile devices make them appropriate tools which can be also used for educational reasons. Referring to this, mobile devices are not as cheap as deskbound computers. These low cost devices can address the lack of computer labs in educational institutions whereas children can have their own devices for unlimited access. Apart from that handheld devices can provide students the possibility to combine their learning experiences in different physical spaces. Learning can take place indoor and formalized - inside the classroom or any other establishments of a school and outdoor - combining physical and digital spaces to create a learning environment with handheld devices, e.g. on field trips to cultural sight seeings or natural woodland.

Previous research to integrate mobile learning technologies into the everyday fabric of schools has been made in earlier years. The importance of having handheld devices ready-at-hand, for the immediate use in classrooms was explained in a study (Soloway et al., 2001). Tools, office applications and functionalities of current desktop computers have been made available in small handheld devices. This enables the inexpensive use of such a powerful technology within the classroom. On the other hand children can easily revise their work with their devices ready-at-hand and are no longer bound to computer labs where they have only limited access and the circumstances to benefit from the advantages of technology are not sufficient enough, e.g. one hour per week (Soloway et al., 2001).

„The portability of mobile technology may be an attractive choice in the classroom for several reasons. Compared to desktops, mobile technologies can stay close to the child. Mobile devices can be used anywhere the child is, making unnecessary a special trip to the computer lab or a return to the desk. In addition, with the price of mobile technologies

decreasing, a one-to-one paradigm that encourages personalization and self-paced learning may become more possible." (Druin 2009)

Mobile devices work faster than old computers and therefore are easier to handle with. Besides children could have access to information right in their hands in order to revise schoolwork and homework. Thus children could spare time without loosing the context of learning. Hence with the personal ownership of such devices they would spare packing a lot of school material in their schoolbags too. Finally low cost mobile devices could be provided one-to-one for every child and increase autonomous working of children with different needs and learning styles enabling them to gain independent learning experiences from other classmates.

The advantages of mobile learning practices with handheld devices have been evaluated in former studies (Savill-Smith, Kent 2003). Palmtop computers were chosen as low cost devices and provided to every child in the classroom. Thus a wide spread use of handhelds could be thought of as financial feasible in contrast to costly desktop environments. Thereby it has been recognized as an unlimited access for children everywhere at anytime proving them a sense of ownership. Children could unfold themselves and work independently on their tasks. These aspects are appreciated for the use of handheld devices in the course of educational institutions for projects inside the school establishments and outside for gaining ubiquitous scientific learning experiences. Furthermore the studies revealed an increase in children's motivation for learning content and a higher social interaction in collaborative learning projects. Apart from that handheld Palmtops could be perceived as assisting devices for teachers, enabling them to monitor and control chilren's development in learning workflows.

A research study on the use of handheld devices in K-12 schools to enhance learning and teaching experiences was made, with 100 selected teachers, indicating teacher's positive experiences with handheld devices, improving students learning activities (Roschelle et al., 2003). There has been reported an increased engagement of students collaborations in group discussions and projects. The use of handheld devices was made in the classroom as well as on fieldtrips. The problems occurring through limited access with only few computers, available in the classrooms could be resolved with Palmtop computers and provide all students a wide range use, thus student autonomy has been increased too. It can be seen, that teachers did not resist making use of new mobile technologies in their classrooms but recognized the need for educational applications for handheld devices.

The educational aspect on the similarity of Palmtop computers with handheld gaming consoles has been recognized in former research studies in order to benefit from the advantages of learning through playing games. Rodriguez et al. (2001) have developed educational applications for Palmtop computers for school subjects, e.g. Math. There was reported that children's collaboration and motivation rose once learning was combined with playfull activities. Remarkable differences in children's attention and concentration have been evaluated when they experienced mobile learning with these handheld devices.

The outcomes of previous research in the field of mobile learning which were presented within the examples above are giving reason for using handheld devices in the course of wireless mobile learning in schools. However we need to recognize that technological improvements have been realized in the area of mobile devices. Thus we can understand that past projects were conducted with the use of technologically older devices. Thereby Rodriguez et al. (2001), Roschelle et al. (2003), Soloway et al. (2001), Savill-Smith and Kent 2003 made use of mobile learning applications on hanhdheld palmtop computers. Therefore new mobile learning applications are needed to be developed for currently predominant

technological standards to address the lacks in this area. Thus smartphones are choosen within this thesis as devices for mobile education in schools. Hence it is appreciated to partner with educators in order to understand their needs in technology and explore ideas about pedagogically desired mobile learning applications for smartphones & for knowledge-centred classroom. Teacher's suggestions are needed to be recognized within this thesis to improve the lack of educational applications.

Harnetll-Young (2008) made a study on integrating mobile phones for learning in secondary schools in the UK. Thereby she indicated schools' own policies, banning mobile phones from schools, because these are still associated as devices in the social context of our lives. However she underlined several points of mobile devices, having an impact on mobile learning possibilities in schools and addressing the gaps of deskbound learning experiences, recognized in early studies (Soloway et al., 2001). Concerning this issue it has been also stated that children's ownership of devices could facilitate their learning experiences.

Furthermore, she has recognized teacher's importance on integrating mobile phones into the everyday fabric of schools. In this case it is necessary that schools produce a culture supporting learning experiences with mobile devices. This can be realized only through collaborative work with teachers and children's educationalists. It is needed to understand teacher's opinions on mobile learning and their concerns as well as doubts on mobile technologies. Only when these approaches can be accomplished teacher's prejudices on mobile learning in schools can be resolved too. In addition we need to know how any mobile learning applications are needed to enhance teacher's teaching experiences and facilitate children's learning experiences.

This study will also take advantage of children's playful approaches in their daily lives to explore ideas about combining gaming experiences with learning content. This will be a crucial factor in order to motivate children and engage them for different kind of learning activities. The question of combining these two issues has been discussed in previous studies.

„How can two so seemingly disparate phenomena as good gameplay and effective, rigorous learning (because that's what we want, of course) be combined." (Prensky, 2005)

The aim was to create learning applications with efficient learning content and interesting enough for children to have fun. Prensky (2005) presented a two dimensional framework to achieve digital game-based learning in order to benefit of the advantages of children's gaming experiences in everyday life. Children's motivation to learn and the degree of efficient learning content have been choosen as variables in order to determine learning applications. Digital game-based learning (DGBL) is described as the ideal distribution of learning applications, with a high amount of motivation for learners and a high learning content. Computer-based training (CBT) has law peculiarity in both dimensions. Educator's concerns on mobile learning applications are indicating that children should not use their devices for playing games; instead they should learn basic knowledge at school. Teacher's prejudices on technology suggest the way new technologies are used to play games. As a conclusion mobile learning applications are needed to be reasonable tools for learning which are engaging enough for children to play games.
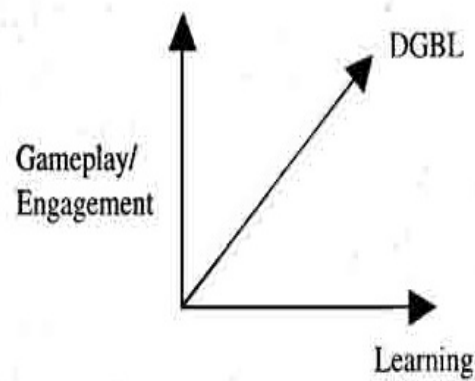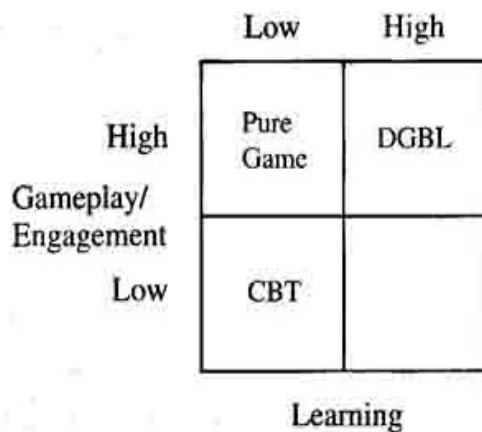
Figure 2.1.: Digital Game Based Learning Quadrant[1]   Figure 2.2.: Digital Game Based Learning 2 dimensions [2]

„Our process in creating digital game-based learning is the following: (1) Find or create a game with great gameplay that will engage our audiance. (2) Find the learning activities and techniques that will teach what is required (doing each with the other in mind), and then (3) successfully blend the two." (Prensky, 2005)

Concerning Prensky's (2005) requirements to fulfil digital game-based learning firstly children are asked in the course of this thesis to design creative learning games. They have a real say in the development of new technology and are taken as appreciated design parnerts throughout this study. Secondly the partnership with teachers will be done in order to talk about ways to integrate mobile learning applications within a well defined curriculum. The requirements for designing and organizing learning activities with mobile devices will be discussed as well. Thirdly children's design sheets of mobile learning applications will be associated within teacher's ideas about mobile learning practices.

Due to the fact that adults as teachers and young people as children will be both consumers of such mobile learning technologies at schools, it is of course naturally to involve both parts into the design of mobile learning applications for educational reasons. Thus, a framework has to be developed with teachers to represent their requirements of pedagogically desired applications for primary schools. Children as design partners having a say on technology is a crucial aspect too. Former research studies of Druin (1996, Druin et al. 1997, Druin et al.1998, Druin 1999, Druin 2002, Druin 2009; Fails, Druin, Guha 2009) contribute very well on this topic. There can be seen how research in this area can be done with children's cooperation and their support in early phases of design. A more precise discussion on concepts we can build up from previous researches with children as design partners, will be given below in chapter 2.5.

As a conclusion there are still areas needed to work on. This can be done best within the natural environment of teacher's workplace, therefore in school settings. There are still open questions where further investigations are needed with a focus on other countries as well as

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[1] (Prensky 2005)
[2] (Prensky 2005)

different age groups. Former research shows areas of practices with adults, thus children of younger age groups are still of interest. All these facts made me curious about making a research with younger children in the natural settings of a primary school in Austria in order to explore ideas about educational mobile learning applications.

2.3   Framework for Mobile Learning

In order to classify teacher's and children's ideas for mobile learning applications in schools, investigated througout this study, we can derive on former attemps of useful classifications for mobile learning. These frameworks can be used to classify, Austrian teacher's ideas on mobile learning applications for primary schools. However a new framework for learning with smartphones in Austrian primary schools should be adapted with respect to teacher's concerns on young children's technology appliance.

Frohberg (2006) presented a framework of mobile learning for classifying it in five categories: free, formalised, digital, physical and social context. Pedagogically desired smartphone applications could be ranged in Frohberg's (2006) *formalised context*. Thereby mobile learning possibilities with smartphones would be offered by educational institutions, in that case primary schools in Austria. Furthermore teachers would be the central actor, whenever they would use their mobile device, assisting their teaching and workflow, e.g. to search for information. However, children would also experience their use of mobile applications, e.g. to retrieve homeworks or worksheets. Finally the classroom or any other establishments of schools would be a relevant context where mobile learning would take place.

Nevertheless classrooms shouldn't be the only places for children to gain mobile learning experiences. Concerning this issue Frohberg (2006) has recognized a *physical context*, as a useful way for ranging ubiquitous learning with handheld devices. Previous research made use of physical environments enriched through digital devices. Studies have been made where mobile devices were used in museums (Druin 2009, Walker 2006a) or woodland for creating the possibility of scientific enquiry learning with children (Rogers, Price, Fitzpatrick et al. 2004). As a conclusion we need to benefit from current technologies and the mobility offered through smartphones. Therefore all of these early approaches should be applied in order to create new ideas for ambient learning projects for example for learning in outdoor school excursions.

Digital context transfers learning content from deskbound computers to the embodied handheld devices, to be carried around everywhere introducing new working environments. Frohberg (2006) emphasizes on children's tangibility and increasing involvement in the learning activity. Thus, smartphones could be carried around everywhere in the classroom as well as in different places on school projects outside the school. In the end cooperation with educators and children is needed in that area to be able to explore ideas about learning occasions with smartphones in the everyday fabric of schools and ambient learning projects.

An overall evaluation of Frohberg's (2006) classification shows how a combination of formalised, physical and digital contexts could be applied in the design of pedagogically desired applications. Nevertheless, smartphones' latest technological possibilities and teacher's approaches towards technology appliance in schools with young children, underline some recognized points to be taken into the design of mobile learning applications. Only when these aspects could be kept in mind, the risk of loosing learning context and the focus problem in mobile learning can be resolved.

2.4 Mobile Learning Applications

When mobile learning applications are developed a significant difference between deskbound applications and mobile applications has to be kept in mind. The latter requires different design methaphors. Whenever mobile learning applications were used, there has always been a danger, preventing learners to interact with the environment. Concerning this matter, the focus problem of mobile learning has been identified in previous research. Göth, Frohberg, Schwabe (2006) described emerging difficulties, once mobile devices are associated to be used for educational purposes. This issue has been recognized as a very important point within this thesis for exploring ideas with educators and children on mobile learning possibilities in formalized, digital and physical contexts mentioned above.

Göth, Frohberg and Schwabe (2006) have found out that learners main focus is lying on the devices and ignoring their environments. Hence they have proposed the development of a new framework for educational applications. A new framework for mobile applications and the requirements to integrate mobile devices into the everyday fabric of schools has to be investigated with teachers and children's educationalists'. Therefore pedagogically desired applications are needed to be designed for children in primary schools. It can be concluded, that further research in that area is needed in collaboration with educators as well as children as design partners.

Previous research has gained important practices of mobile learning applications. Roschelle (2003) classifies mobile learning in three commonly used classroom applications: *classroom response systems*, *participatory simulations* and *collaborative data gathering*. Roschelle (2003) emphasizes on the new challenges of using Wireless Internet Learning Devices (WILDs) in the classroom and differentiates between two ways of participation: communicative participation of children and teachers acting in the social construct of the classroom as well as technology as informatic participation with connected devices.

As the new technology layer of handheld devices enhances education and knowledge and changes the classrooms settings into learner-, knowledge- and community-centered spaces, it can be also a trigger for disruptive behaviour and violate classroom social patterns. To this effect two aspects are needed to be identified in primary schools. Firstly an explanation has to be done on what kind of technology is permitted in schools. Secondly it must be clarified when and where these technological devices can be used. Thus a specification to determine the amount of mobile phone usage in Austrian primary schools for educational purposes has to be done.

Roschelle and Pear (2002), describe the use of WILDs in future classrooms to enhance the possibilities of Computer Supported Collaborative Learning (CSCL), the latter always bound to a computer or notebook.

Druin (2009) has broadened Roschelle's (2003) classification of mobile learning applications with two more areas: *content creation & narrative learning environments, field trips*.

In the following, examples of mobile learning applications from previous research will be discussed. Important outcomes will be evaluated to use within this study and experiences of former projects will be introduced.

2.4.1 Content Creation and Narrative Learning Environments

The digital age has enabled us to create and share media content. Commonly used web applications such as *Flickr, Facebook, Twitter* and others allow us to produce and share information (Druin 2009). These features are being used by children too. They like it to create their own media types, e.g. photos and videos and are likely to share it on digital spaces with other friends. The production and distribution of knowledge has also shown it's appearance in educational settings (Brun et al. 2007). Regarding this, primary school aged children's practices and experiences with content creation and distribution will be exemplified in the course of this thesis. Their habits of social media as well as opportunities for applying content creation withing educational context will be discussed in this study as well.

Content creation with mobile wireless technologies has it's roots in narrative learning environments. Narrative learning environments can be explained as technology based learning environments which are used to improve the learning activity (Dettori 2007). Story telling and story authoring – activities are done in relation to a given task. Dettori (2007) gives reason that stories are natural things to human beings. Therofer he underlines that every person can understand and produce stories, regardless of his age. Thus stories are suitable for children as well as adults to facilitate learning and reflect learning content. Possibilities for narrative learning will be explored with children in their daily practices at school. Such narrative learning is appropriate when a subject is learned in environments with much communication (Dettori 2007), f.e. the visiting of historical places, museums or other school executions (Druin 2009) would be proposed in this study to think about.

Dettori and Gianetti (2006) characterize narrative learning environments in three dimensions and recognize the positive relation between NLEs and mobile learning (Dettori 2007). Both of these issues are coupled with informal learning. Hence mobile learning is suitable with narrative learning environments.

Former practices of narrative and mobile learning give examples on how different types of media (e.g. photos, audio, video) can be recorded with mobile devices during outdoor school executions and uploaded on a webpage for revision later on (Walker 2006a, Walker 2006b).

Walker (2006b) reports about his practices with *My Space Art*[3], a webpage they have developed for children, which was suitable with the curriculum and could be used in terms of the school subjects history and arts. Groups of four to five children between the age of 9-10 were provided mobile phones with a software to record data. All captured data was uploaded automatically to the webpage and narrative trails were created.

Walker (2006a) uses the creative approach of story telling in one of his other projects. Narrative paths are created in museum visits and shared with other ones; these can be improved later on to make audio guides for visitors.

Referring to these examples, possibilities for practices with narrative learning on school executions and technological settings together with definition of the amount of devices used there, will be discussed with teachers in this study.

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[3] http://www.ooklnet.com/web/

2.4.2 Field Trips - Learning Outdoor - Ambient Learning

Mobile technologies provide us the possibility to combine field trips with ubiquitous computing. Field trips are a convenient possibility where learning can take place outside the classroom with the use of mobile devices. It enables children to engage with environments first hand, making children curious about environmental happenings and forcing them to investigate. This form of learning can motivate children and encourage them to discover new issues on the learning subject. Learning experiences can be taken indoor in the course of field trips to cultural or historical interesting places, e.g. museums or labs, and children can review information about their environment and what is observed in the palm of their hands (Rogers et al., 2005). Learning can take place also within outdoor activities, e.g. in woodland, green parks, zoological gardens.

Former research projects show the advantages of field trips with mobile devices, triggering children to investigate and inform themselves about their environment. In the course of the Ambient Wood project (Rogers, Price, Fitzpatrick et al. 2004) children were equipped with mobile devices in the woodland and could do scientific enquiry in order to confirm information displayed on their devices with data they collected in environmental settings. The open-ended non-structured learning tasks facilitated the experimental approach, but a follow up activity was hold afterwards in the physical settings of their classroom, discussing important issues with their teacher (Rogers, Price 2004).

A study about ubiquitous computing field trips has been made, addressing literacy problem in primary schools and supporting children's creative writing (Halloran et al., 2005). We can derive on the results of this study as well for involving storytelling and narratives in primary schools in Austria.

To summarize, Druin (2009) underlines that field trips can be applied reasonable and achieve effective learning results, however it has to be considered that children should not keep their attention on the devices too much, otherwise they could miss environmental happenings.

Concerning ambient learning, it would be interesting to know from what ages on these projects could be applied in primary schools in Austria. Very little children in the first two grades of a four year primary school could have complications to work with handheld devices in the environment, whereas 3rd and 4th graded children could enjoy it to spend a day in the park investigating about animals and plants. Concluding, teacher's willingness to organize such executions and ideas on outdoor learning possibilities are needed to be researched.

As a result to all these mobile learning applications, approaches of previous research projects, served to build up my research questions. Discussions on mobile phones and smartphones associated as devices in social context, as well as the lack of pedagogically desired applications for integrating handheld devices into the everyday fabric of schools arose. The need of working with different design methaphors and including children into the design of educational applications in Austrian primary schools was recognized.

New technological possibilities of smartphones for creating learning experiences in different environments have strengthen me to investigate about combining learning activities in several places inside and outside the classroom.

2.5 Working with Children as Design Partners

In some early research projects that came up with the computer era in the mid 90s, there has been recognized the importance of including children as design partners into the design of new technology. Allison Druin, emphasizing on the difference childrens' participation makes on building new technologies, recognized how childrens' opinions are asked in too late phases of the development, when their honest views of technology could no longer have influence on what has been developed (Druin 1996). Childrens' role in technology was determined in a way, that they were principally testers of adult researchers' own established ideas (Druin 2002). One of the mistakes happening very often,whenever adult researchers tried to imagine childrens' likes and dislikes', revealed itself as a big failure.

The final role of children as design partners has been established over years through the evaluations and practical experiences of numerous research projects. Childrens' role and their involvement in technology development, shifted from testers, to informants and children finally became appreciated design partners.
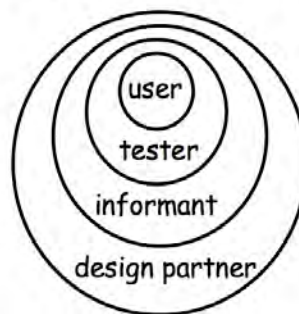
Figure 2.3: Childrens' roles on the design of new technologies[4]

The partnership with children throughout the realization of entire projects, has been realized in Druin's work at the University of Maryland Human Computer Interaction-Lab, where children between the ages of 7-11 are invited twice a week to work on current research projects (Druin 2002).

Druin's research team developed new technology design methodologies, to support childrens' role as design partners, when technology is designed for children (Druin 2002). In the course of these experiences, childrens' cooperation into the design of computer and web based applications for children, could be adapted to improve the outcomes of past projects.

In the course of Knowledge Adventure, researchers developed a webpage in collaboration with children (Holzberg 1995). The interface of this encyclopedia was established in talk with childrens' daily activities. Thus there came the idea of making a tree of knowledge and use children's imagination as a playful approach to search for information.

„Children two to four years of age were asked; ‚Where do you most like to play after you go home from school or daycare?' What designers heard was ‚play out- side', and ‚climb a tree'. This information was taken to heart and a ‚tree of knowledge' was created for young children to explore. As opposed to selecting keyword or menu choices, children can select any part of

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[4] Druin (2002)

the tree branches and consider information about the stars, or the food we eat, or how our bodies work. It is a well-executed interface, which started with children's own ideas."
(Holzberg, 1995)

A remarkable difference as stated above, can be seen between adult people's ideas and children's thoughts more often in the design of new technologies. Thus the importance to benefit from children's imagination with their honest views, favours and dislikes should be understood in order to establish useful technologies for children.

„Without spending time with children, we as designers couldn't know these things. We couldn't take advantage of this knowledge to design interfaces that offer children paths to learning and play in ways that seem natural to them." (Druin 1996)

Children naturally have a playful approach to knowledge in their lives. This can be undestood the best way through partnership and collaboration to create interfaces that are not alienating children from their environment and combining learning content with playful activities.

With KidPad a prototoype drawing tool was developed in collaboration with 3 to 13 year old children (Druin 1998). Different research methodologies were explored in the design of these projects to support a child's role in the development of new technologies.

„..it is critical to find methodologies that support a child's role in the design process. Whe have begun to combine participant observation techniques with participatory design experiences. In this way, we believe we can better understand what children may do with technology, and what they may want to do with it in the future."(Druin et al., 1997)

Among these examples, the findings from Contextual Inquriy and Participatory Design were choosen to be taken within this thesis.

Contextual Inquiry, presented as a possibility to collect data in the natural environment of children and observe their daily activities. Thereby researchers observe children performing typical activities and ask questions. Through practices with Contextual Inquiry, there came out that children felt uncomfortable with researchers' note taking. Druin et al. (1997) suggest researchers, to play the role of a participant observer, communicating with children in a natural manner. Regarding my research within thesis the everyday fabric of schools is chosen for conducting Participatory Design with children in their classrooms. Apart from that current technological possibilities will be used for data collection, e.g. audio recordings of design sessions with children will be done, to create a sense of wellbeing in the classroom. Furthermore researchers' appereence is also crucial factor, when design is made in a place familar to children. In this thesis, I will take care of wearing informal clothings during the collaborative design sessions with children (Druin et al., 1997), as they should not get the feeling of working with a stranger. In that way there could be established a feeling of commonness between researcher and children.

Participatory Design with children is an additional methodology emphasizing on the importance of working with children in early phases of the design process. In the course of design sessions small groups can be build of children and adult researchers, where low tech prototypes are produced collaboratively (Druin 1998).

„As opposed to being observed, with this methodology children are directly asked to work with researchers to collaboratively create "low-tech prototypes" out of paper, glue, crayons, etc." (Druin et al., 1998)

In this area Participatory Design is a low-cost research methodology, to work with simple arts and crafts material, e.g. paper, crayons, glue, scissor. Children know how to handle these low-tech prototyping tools and can use it to express their thoughts within a creative frame. KidPad, a drawing tool for children, was also developed with Participatory Design and design teams of 4th grade students and adult researchers (Druin 1996).

„We have found that children ages seven to 10 years old make the most effective design partners. These children are self-reflective and verbal enough to discuss what they are thinking. They can understand the abstract idea of designing something on paper or in clay that will be turned into technology in the future." (Druin et al., 1998)

To understand children's needs and concerns in new technology, we have to observe them in their natural setting while they have practices with technology. But apart from it is required to give children a chance to have a say on technology and shape the design of new inventions. Concerning this issue we see that younger children find it more difficult to verbalize their thoughts. They need more time to formulate their needs. Thus primary school aged children are found as appropriate design partners.

Participatory Design with children, will be taken as one significant research methology to collect data within this thesis. Third and fourth graded primary school ages children between 8-10 years will participate in this study. There will be given care of arranging small groups with children and create a group harmony. Apart from that, approaches of Participatory Design will be applied in order to explore childrens' ideas on mobile learning applications and create low tech prototypes out of paper and crayons. There will be taken benefit from advantages of low tech prototypes, as a trigger for brainstorming processes (Druin et al., 1998; Druin 2002). In addition, Contextual Inquiry will be done as part of Participatory Design sessions with children and childrens' practices with their mobile phones will be observed and reported. Children will be asked question about their daily use of mobile phones and be invited to explain their experiences and applications they use within a storytelling activity (Druin 1999).

2.5.1   Advantages of Children as Design Partners

The advantages of working with children as design partners have been recognized in former projects. Whenever new technology is designed for children, it should be naturally assumed to include children in early phases of the design process, where they would have the possibility to express their opinions and influence workflows directly. This aspect is emphasized in Druin's work (1996) by explaining the importance of understanding childrens' needs in technology. Accordingly it can be seen that children have different likes and dislikes, than adults. Therefore it should be taken benefit from childrens' open minded approaches towards technology and their ideas, which adult people can not even imagine to think about.

Children have a playful approach towards all kind of activities in their lives. Thus mobile learning applications will be shaped of children's gaming experiences and engage children to

learn. Therefore we need to work with children for the design of new learning applications with gaming experience.

„Most learners will be excited when they hear you are designing a game for them, but they will also be skeptical. So much learning is boring and done to learners, that people need to be clear that the game is being made to engage them and that ideally they have a real say in its design." (Prensky, 2005)

We will appreciate children as our design partners, as they like it to be taken seriously. As recognized design partners they are exited about having the possibility to invent mobile learning applications of tomorrow.

In the course of the following study, children can contribute on exploring their minds about mobile learning applications with smartphones. The impact of such technologies is a great issue in their daily lives. They are not strangers to smartphones and have practices with all kinds of applications from gaming and entertainment to social media apps. All these conclusions make children as appropriate design partners to participate in this study.

2.5.2   Challenges of Designing Technology with Children

The partnership of children in the design of new technology offers many outstanding possibilities and has positive impact on what has been designed. However research projects, with an interest on working with children as design partners, have to be carefully planned and adapted on current circumstances. In the following there will be presented experiences of past projects and challenges they have encountered in working with children, in order to learn what kind of situation we have to expect within the work of this thesis.

Druin (2002) indicates, that traditional school settings can be a challenge for researchers and shape the workflow of applied research methodologies. Thus researchers have to count limitations in organizing their research activities, e.g. I have to adapt myself on teachers' leisure times for conducting qualitative interviews with them. Apart from that there has to be defined when the research methodologies would be applied, during school lesson on a school day or after the school. In addition, it is needed to be clarified where the research would take place. Concerning this issue, establishments of a school are most appropriate to conduct the research of this thesis, since it would be within the natural environment of teachers and children participating in this studuy.

Furthermore, parents could feel comfortable, when this study could be arranged in a place they know and their children are familiar with. For this reason, parents could feel safe and be sure about their children residing in a secure environment during the research practices. This could be a trigger too, giving permission for their chilren to participate in this study. Thus childrens' participation for design workshops could be maximized.

However the fact of conducting this study in a school ca be a disadvantage too, once it could be perceived from parents as a way to prevent and disturb childrens' daily learning activities at school.

When the research should take place after school, it must be taken care not to interfere in childrens' leisure times and afterschool activities. Nevertheless, the research methodologies applied in this thesis will be practices for a short time. Thus, the probability for disturbing childrens' spare times is very little.

Another aspect mentioned in Druin's (2002) work are predominant unconventional research activities, when design is done in collaboration with children. Researchers have to be concerned about this occurances in advance. As a result, the instructor has to bear control in case of a loud noise in the classroom. Apart from that children like to talk about their ideas on a given topic, but quickly loose the mean subject talking at once and making jokes about funny things. There it is important to keep childrens' attention on the theme of this thesis, to design mobile learning applications with the help of children.

Druin (2002) also suggests, that every single participant of a design group should have same conditions to be in charge. Regarding this, there will be small groups of children planned for this study. Everyone will be treaten with respect to feel free, mentioning their opinions on technology and suggesting their likes and dislikes, things they like to do and things they don't like. Apart from that, children will be given a general topic, based on this they will be free to design whatever they want to, using different ways to express their ideas, e.g. draw, write or storytelling. There will be also given care to intervene in disruptive behaviour influencing childrens' social interaction. Thus, the instructor has to calm down conflict situations and interfere once if children would have a quarrel.

In the end we must be aware of childrens' capabilities, when working with them. Hence there is no right to assume, children having specific knowhow about given topics.

„We cannot expect them to program as well as computer scientists. We cannot expect them to know what educational goals need to be covered in a school curriculum as a well as a teacher does. But we can expect children to tell us what excites and bores them, what helps them learn and what can be used in their homes or schools. We can expect children to be creative, honest collaborators.“ (Druin 2002)

„While children may not be programmers or engineers, they are experts in what they want and why they want it. We believe that children have a great deal to say about the world they live in and the technologies they use.“ (Druin et al., 1997)

For the implementation of research methgologies in this study, it doesn't make sense to expect children defining educational requirements or specifications of a well defined curriculum. Those aspects have to be clarified in talk with teachers and children's educationalists'. Instead, a benefit of childrens' honest views about technology and their imagination on mobile learning applications for schools, should be taken as an importan input. Childrens' favours of mobile applications, their dislikes on learning activities and enthusiasm to use their mobile phones for learning in schools, can be investigated. Apart from that we can learn childrens' daily practices with their mobile phones and explore ideas about applying it in educational contexts.

Summarising all the knowledge gained from previous studies in the field of mobile learning which were presented in this chapter, the findings of these projects are appreciated and will be taken as critical points in order to shape the investigations of the following thesis. Firstly handhelds will be taken as low cost devices that can address the lack of computer labs in educational institutions, which provide only a limited access to children with old and slowly working computers. Thereby smartphones will replace palmtop computers which were used in past researches in order to experience mobile learning in formal boundaries of schools. Thus ideas about mobile learning applications will be explored primarily for smartphones.

Concerning this issue Hartnell-Young's (2008) suggestions on mobile phones as devices in the social context will be taken to benefit from children's ownership and familiarity.

Secondly ideas on mobile learning applications for smartphones will be investigated with teachers and children to enable them the usage of such devices ready-at-hand in different contexts. Hence Frohberg's (2006) findings on a Mobile Learning Framework are descriptive for designing mobile learning applications within this thesis. These applications should be used outdoor on fieldtrips, e.g. school excursions to historically important places or learning projects in the nature. Apart from that knowledge from existing mobile learning applications in the course of content creation and narrative learning environments are significant points and have an influence on mobile applications for storytelling activities in the course of this thesis.

Thirdly Prensky's (2005) experiences on Digital-Game-Based-Learning with deskbound learning applications are relevant for this thesis and have an impact on the development of mobile learning applications for smartphones with a playful learning approach in order to motivate children for learning content. Thereby children can learn factual things passing by and train their mathematic skills while they play a game.

Fourth Druin's experiences of working with children as design partners are especially recognized in the implementation of my research methodologies. Participatory Design with children is conducted within this thesis in order to collect children's ideas on mobile learning applications and produce low-tech prototypes with arts and crafts material.

3 Implementation of Research Methodology

The process of research methodology implementation in this study followed two phases. First of all semistructured interviews were conducted with four teachers and children's educationalists at primary school St. Elisabethplatz, Vienna. Secondary five Participatory Design workshops with children of the same institution were held. Subsequently the analysis of all applied research methodologies took place. In order to give answers to all research questions mentioned in chapter 1.3, qualitative data was collected in terms of audio recordings, digital photos and design sheets. Audio recordings of qualitative Interviews with teachers were transcribed in 1046 lines, whereas participatory design workshops with children used 1804 lines to transcribe. A total number of 43 design sheets were collected during the participatory design sessions with children. 4 pages of hand written notes were taken in a design group, where audio recordings and digital photos couldn't be done. Throughout the analysis of this study 45 mindmaps were prepared, thereof 41 mindmaps concerning the outcomes of participatory design sessions and 4 mindmaps as evaluations of qualitative interviews.

In the following information will be given about all requirements, which were necessary to carry out this study.

3.1 Organizational Issues

For the realization of this research study several steps were needed to be accomplished. After a qualified primary school to conduct this study was arranged, the schoolmaster was contacted. As part of a personal meeting, motivation and aim to carry out this study in the choosen institution was explained. An open minded approach was taken indicating the interersts of investigating teacher's attitudes and concerns on technology usage in education and pedagogical requirements of mobile learning with handheld devices in schools. This opportunity was also taken to give an understanding of the importance of working with children as design partners when technology is designed for children. The school principal took a great interest in these ideas and agreed to participate in this study with a verbal promise.

The next step was to contact the Vienna Municipal School Authority (*Stadtschulrat für Wien*) for a request to carry out this reserch study. All documents for application were prepared including informations concerning: the duration of investigations at the school, the execution of the research project, examples of consent form and information sheets for parents and teachers, the verification of my advisor to supervise this diploma thesis, theoretical background and literature review, research questions, research methodologies, a formal obligation for data privacy protection and an obligatory agreement to provide a summary of my evaluated results to the Vienna Municipal School Authority.

After the application was made to the Vienna Municipal School Authority, it took about one month to receive a letter confirming the realization of this research study.

Subsequently information sheets and consent forms for parents were given to the class teachers of 3rd and 4th grades. The class teachers kindly handed out these sheets to all children in their classes. Furthermore the class teachers and assistant teachers supported me to collect all signed consent forms.

Information sheets and consent forms were handed out to class teachers and assistant teachers of 3rd and 4th grades as well. In the preparation of these sheets I paid attention to give a direct and personal appeal to all teachers, therefore their real names and titles were used.

The whole study was carried out in the premises of the public elementary school St.Elisabethplatz[5], Vienna. Data collection and later analysis were done anonymously. The following tables give relevant information on research methodologies, choosen to be adopted in this study, provinding answers to our research questions, as well as participant's general characteristics.

Research Questions	Research Methods
RQ – 1: What are the ways to adopt smartphones for learning context within a well - defined curriculum?	Qualitative Interviews (4)
RQ – 2: What are significant points for teachers to get their acceptance for integrating mobile learning technologies in schools?	Qualitative Interviews (4)
RQ – 3: How can pedagogically desired applications be designed?	Participatory Design Sessions (5)

Table 3.1: Research Methodologies

Participants	Age	Gender	Responsibility	Technological Knowhow
T1	58	female	School Principal, Class Teacher 3A	Teaching Construction in Computer Science, experiences with smartphones and mobile applications
T2	43	female	Class Teacher 3B	Experiences with smartphones and mobile applications
T3	60	female	Class Teacher 4B	No experiences with smartphones and mobile applications
T4	45	female	Assistant Teacher 4B	No experiences with smartphones and mobile applications

Table 3.2: Participants of Qualitative Interviews

In the following chapters teachers will be mentioned with their nicknames, since the characteristics of these persons can be looked after on the table above.

Four qualitative interviews were done in calenderweek 21 and 22, 2012, with teachers and children's educationalists. Participant's age range was between 40 and 65. The interview

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[5] http://www.schulen.wien.at/schulen/904011/

questions followed an semistructured interview guide and were hold in the participant's mother tongue German. These interview questions can be found in the appendix of this thesis in the section 8.3.1. All interviews were audio recorded and transcribed word by word for later analysis.

In the course of the analysis all transcribed documents were coded with thenatic coding. Based on these outcomes and the initial research questions common keywords were defined. By means of these keywords the transcribed interview documents were transformed into mindmaps. Each mindmap was created for one interview as a simplified representation of the general foundings.

Five participatory design sessions were hold in calender week 21 with 3rd and 4th grade children. The groups were arranged with attention to parent's preferences, their acceptance of data collection and their agreement for audio recordings and digital photos. Trying to keep the design groups small, three design sessions took place with 6-8 participants; one group was formed with 10 participants on agreement with the class teacher, since the founding of two seperate groups would be difficult to organize because the class had upcoming exams; and the last group with 4 participants containing all the children whose parents did not allow to collect any audio recordings or digital photos. In this case the instructor of the design session took hand written notes to collect data.

Participatory Design Sessions	School year	Gender	Total
3A – Group 1	3rd grade	4 female, 4 male	8 children
3B – Group 1	3rd grade	7 female, 3 male	10 children
4B – Group 1	4th grade	2 female, 5 male	7 children
4B – Group 2	4th grade	3 female, 5 male	8 children
4B – Group 3	4th grade	3 female, 1 male	4 children

Table 3.3: Participants of Participatory Design Workshops

Participatory Design Sessions	Data Collection
3A – Group 1	audio recordings, digital photos, children's design sheets
3B – Group 1	audio recordings, digital photos, children's design sheets
4B – Group 1	audio recordings, digital photos, children's design sheets
4B – Group 2	audio recordings, digital photos, children's design sheets
4B – Group 3	hand written notes, children's design sheets

Table 3.4: Data collection in Participatory Design Workshops

After the design sessions were carried out audio recordings of the workshops were used to transcribe the sessions word by word. All transcriptions were done anonymously and coded with thematic coding as well. In the next step, children's suggestions and comments were analyzed with regard to the research questions. Based on these results common keywords were established to create a simplified representation with mindmaps. In summary composite mindmaps were developed to understand the relations and equality between children's suggestions.

Example sheets of interview and participatory design transcripts, as well as mindmaps can be found in the appendix of this thesis in chapter 8. The complete data, collected within this research study serving for the analysis can be found on the enclosed CD-ROM.

3.2 Ethical Issues

Whenever qualitative research is done with people there are strict requirements which are needed to be fulfilled. First of all people must be ensured that their participation is voluntary and they have right to break off the session whenever they want to. Secondly information sheets and consent forms must be prepared to give an explanation of the case and inform the people about data collection and analysis.

Information sheets and consent forms were developed both for parents of children and teachers. The participation in this research study was voluntarily for both parts.

The information sheets contained a brief introduction to the research topic as well as a specification of the research methodologies, where participant's interest was asked. The duration and settings of interviews and participatory design workshops were named. In addition it was stated that all interviews and design sessions would be audio recorded for later analysis. Furthermore people were told that all data would be collected anonymously and be used for later analysis.

In the consent forms, the participants had the possibility to decide upon a variety of issues and confirm their acceptance or not. This was a very important aspect and needed to be planned and treated with much care. Overall the participants could give their acceptance for participation, data collection and the final analysis and distribution of collected data. They could choose whether they agreed on audio recordings and digital photos of them taken during research sessions and could determine whether they wanted to provide their data for the distribution of this thesis at the Vienna University of Technology.

For the participation of children as design partners their parents completed and signed their consent forms.

An example of information sheets and consent forms can be found in the appendix of this thesis within the sections 8.2.1 and 8.2.2 as well as in the enclosed CD-ROM.

4 Analysis of Qualitative Interviews with Teachers

Qualitative Interviews were part of ethnographic research methodologies used in this explorative study. Personal interviews with four teachers of primary school St. Elisabethplatz could be arranged for data collection. The interviews were carried out in a place familiar to the participant's own context. The most convenient setting for conducting personal interviews was in the natural fabric of schools. The interviewer adapted herself depending on where the interviewed teachers stayed, e.g. teacher's room, assistant teacher's room or the department of the school principal was choosen.

All interviews took place during school hours in calenderweek 21 and 22, 2012. Interview times were organized in commonly agreement with teachers. I used this opportunity as well to introduce myself to the teachers and explain my interest in talking to them.

Blomberg et al. (2009) point out the characteristics of unstructured interviews in the course of a conversation with an informant as a possibility to understand the perspectives and point of view of the interviewed person. This approach is suitable with the investigations of this research study and the achievements of collaborating with teachers and childrens educationalists trying to understand their general attitudes about technology usage in schools and comprehend their concerns and fears on integrating mobile learning technologies in schools. In that way it could be also recognized how any mobile applications for handheld devices are needed and ideas about the requirements of pedagogically desired applications for smartphones could be collected.

Furthermore Blomberg et al. (2009) emphasize on the advantages of using unstructured interview guides enabling the researcher a freedom to focus on the informants statements. Thus the interview questions don't have to follow a strict protocol but a basic framework of questions to be asked during the interview is provided. This basic framework provides the researcher all essential aspects and allows to guide the interview depending on the informant's answers.

As a consequence all interviews were unstructured and conducted as a conversation. At the beginning of the sessions, informants were asked for permission of audio recording even though they already had stated their confirmation in their consent forms. This was a sign to treat the participants with respect. Apart from that care was given to establish a good rapport to the informant and the interviews began with an opening smalltalk. At the beginning and the end of the interview the reseacher thanked the participants for sharing their time and participation.

In the following sections the outcome of these interviews will be discussed.

4.1   Legal regulations concerning the use of mobile devices in schools

In Austria the government has no written policies to define the usage of mobile devices such as mobile phones or smartphones in schools. Instead schools have got the authority to develop their own policies, determining the use of mobile devices within the boundaries of their institutions. In the school regulations of primary school St.Elisabethplatz, Vienna it is stated that mobile phones are not allowed to be taken at school[6]. In former times, teachers strictly followed these rules. It was necessary to prohibit mobile phones in schools when the phones started to beep during school lessons and children's attention was disturbed. Meanwhile teachers have widen their point of view and loose regulations predominate. Teachers can now understand that mobile phones are practicable devices when children need to communicate with their parents in case of need, e.g. emergency cases. According to this mobile phones can be turned off and packed inside children's school bags. The phones are kept off between 8am and 1pm,until the school building is left[7]. Apart from that children use their mobile phones to inform their parents about daily happenings in school, e.g. when they have to come earlier or later. In all these issues teachers understand the flexible usage of mobile phones and permit children to carry it at school when it's turned off. As a conclusion teachers don't find it terrible, when mobile phones are taken school as long as they are turned off and not used during school lessons and school break[8] or children don't play with them except for learning applications[9]. However there are also teachers preferring schools to be taken as „technology free zones" where children should not get in touch with technology except of using existing computers in the classroom[10]. The middle course of using mobile phones in the everyday fabric of schools can be explained too. In this case teachers prohibit the use of mobile phones during school lessons however they're opinion concerning school breaks can be distinguished from the examples given above. T3 permits children to use their mobile phones in school breaks to play games[11] and thinks that school breaks are there to relax and to come to other thoughts[12]:

> *„Well..I'm one of those few teachers, where children are allowed to use it during school breaks to play games, because I have the opinion, that..break time is for relaxation..and I can't find nothing wrong when they play a game on their mobile phones or take any gaming consoles and play during break time..it's a leisure time and they are allowed to spend time on it, they can even use computers to play games. Well I think it's great for leisure activities and to relax. But it's a taboo during school lessons." (T3: 57-63)*

However the opinions are shifting when concerning the way children spend their time during school break. T4 thinks that children should use the advantage of their leisure times in school to move outside the class and take fresh air instead of sitting there and interacting with their digital devices:

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[6] T1, see section 8.3.2.1 Interview Transcript Class Teacher– 3rd grades: 3A; lines: 5-14.

[7] T1, see section 8.3.2.1 Interview Transcript Class Teacher– 3rd grades: 3A; lines: 18,19.

[8] T2, lines: 16-18; 20,21.

[9] T1, see section 8.3.2.1 Interview Transcript Class Teacher– 3rd grades: 3A; lines: 14-16.

[10] T2, lines: 23-25.

[11] T3, line: 57.

[12] T3, line: 58.

„Well I'm not a friend of these devices, because the children are sitting the whole time and when they continue to sit during break times as well...I'm more likely a supporter saying: Yes to work, whatever you use for it, digital or not, but the leisure time should take place outdoors to catch fresh air and renew mentally (laughing)." (T4: 38-42)

Finally all of these different understandings determining the way mobile phones are used in schools have a consistent aspect, explaining that the appliance of mobile phones during school lessons is prohibited. Teachers commonly agree that mobile phones must be switched off during lectures. In terms of school breaks where no lecture is done the opinions differ. Firstly mobile phones are kept off for the whole school day until the school building is left. Secondly children can turn on their mobile phones or any other gaming consoles in order to play games during their leisure time in school breaks. Teacher's general attitude about the use of any mobile devices at school can be distinguished, whether these can be used in children's leisure times at school or not. However we can conclude that break times in schools are done to relax from the lectures.

4.2 Teacher's technological know how and their motivation to use smartphones for learning and teaching in the classroom

At the beginning of this chapter general information about teacher's knowledge of technology will be given. We will get an insight of their daily practices with technology and their experiences using technology in the classroom. Teacher's attitudes towards technology appliance in educational institutions and their motivation to use handheld devices for learning content in school will be discussed as well.

Teacher's technological knowhow is a substantial point to understand their overall engagement for technology usage in educational settings. Practices in their daily lives as well as the amount of technology they use for teaching indicate how much they are informed about technology. Thereby a significant reliance can be named between teacher's motivation to use technology in the classroom and how much they are capable of it. Hence their overall motivation to use technology is coupled with their technological experiences. In addition well informed teachers having experiences with mobile applications are not anxious about the effects of using technology in the classroom and own fewer prejudices.

In the course of my study I have determined between two shifting positions: one of young and well informed teachers and one of teachers belonging to the older generation with traditional teaching methodologies.

T3, belonging to the first group of educationalists, having a teaching profession in computer science was confident about her technological skills. She took the opportunity for getting a teaching profession in computer science in order to be well informed about technology and share children's experiences of technology when they are working with computers in the classroom:

„This was the reason why I studied the lectureship, because I thought this is the dream of the future („Zukunftsmusik"); and if I'm not well informed and the kids know a lot, that's not what I want (is laughing)..that's why I studied it.." (T3: 260-262)

T3 was also certain to have it under control how technology is used in her classroom. She explained that children are using the computer in the classroom for an arranged time. Thus she makes adjustments so that children only have access to secure webpages for children:

" If you are well informed, you loose your fears, otherwise you don't know what the children are doing and you can't change there anything...I have it under control, that's why I studied it" (T3: 262-264)

The way teachers are informed about current technological standards defines their attitudes towards the appliance of technology in their classrooms. It demonstrates how teachers make sense of present technological devices and the way they integrate it in their lectures.

In the current state there are classes with an educational emphasize on technology. The main focus of T3's class lies on computers with an arranged time („Freiarbeit") for working with computers[13]. However, in contrast to laptop classes where every child has an own device, the financial possibilities in public primary schools provide only a little amount of devices for one class. In the following is an example of the current technological cirumstances in the class of T3. There are 5 computers for a whole class with 20 children[14]. Thus does not enable the children to work simultaneously on the computers whereas every child has an own access and login information. Still teachers try to make the best out of it and understand it to integrate computers for educational purposes. In the course of „Freiarbeit"[15] there are several tasks to do, some of them are done without the computer others require a computer to work on. Educational computer games referring to the school books are done in the course of school subjects german or mathematics[16]. This enables teachers to monitor children's learning flow and see how far one child has finished a task for a given school subject. Apart from that only 2 of 5 computers have internet access, these are used to visit webpages for children and retrieve informations[17].

Among the second group of educationalists teachers are not familiar with the current technological state. They can't report about any practices with smartphones in their daily lives because they don't have a smartphone. Mostly they are using older phones in their daily routine meeting all their needs. These teachers are strangers to the possibilities ermerging through smartphones.

Following is an example of T3, having two years to retire and almost reached the end of her working time. T3 is aware of the fact that she is representing the older generation of teachers and does not have any practices with mobile application or smartphones:

„My mobile phone is inappropriate for educational purposes (takes her clamshell in her hand, it is a simple old model), this is a mere telephone device. " (T3: 105,106)

„Children are more informed about these things than me." (T3:97)

„I am very badly informed about these things." (T3:117)

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[13] T3, lines: 27-31.
[14] T3, lines: 27,28.
[15] T3, lines: 30-31.
[16] T3, lines: 38-41.
[17] T3, lines: 171,174,175.

However being not well informed about smartphones and mobile applications does not prevent her to understand that new technologies could facilitate learning and teaching in the classroom. Thus she recommends to find a balance between traditional and technological teaching modalities[18]. Furthermore well educated teachers with technological know how are needed to be taken as reference partners when mobile applications should be applied for educational purposes. Teachers must be capable to use mobile technology, to reasonably apply pedagogically required mobile applications within a well defined curriculum and enhance children's learning activities as well as their own teaching:

"I myself as a teacher should be familiar with it in order to use it reasonably." (T3:158,159)

Under these circumstances smartphones could be applied as a supplement for gaining learning and teaching experiences[19]. Nevertheless teacher's need to be informed about mobile applications in order to use it for learning content. Thereby they are aware of the fact that children in their classes have more experiences with smartphones.

Teachers having a smartphone and experience with mobile applications can much better make a sense of using mobile devices for educational purposes in school. They can explore their minds and share their ideas for pedagogical required applications in order to adapt smartphones within a well defined curriculum. Thereby we can derive on self assessment of the teachers.

T1 and T2 were, compared with T3 and T4, well informed about technology and smartphones. In fact they had own smartphone practices in their daily lives, they knew about the possibilities of smartphones enabling people a broad spectrum of usage.

T2 gained positive experiences in her personal life where a mobile learning application for smartphones helped her six year old daughter to train calculation skills:

„I myself have excellent experiences with my little daughter, who has perfected her time table rows with a smartphone mathematic software" (T2:58,59)

This shows that teachers are aware of the possibilities enabled through smartphones. Furthermore it indicates how mobile applications with pedagogical content could support children in their learning activities. Subsequently teacher's motivation to practice technology in school settings raises whereas it is applied with computers provided by the school or teacher's own mobile devices as smartphones.

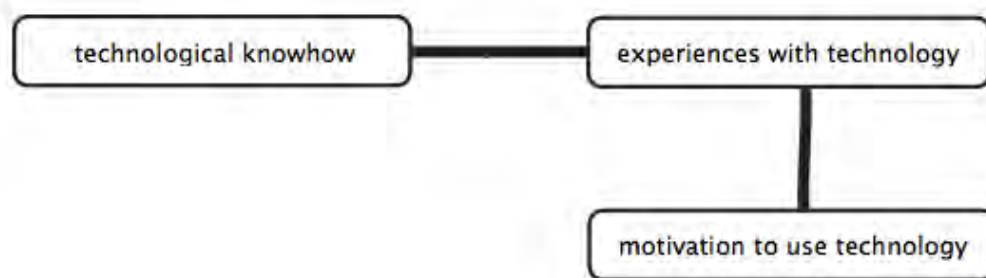[18] T3, line: 182.
[19] T3, line:183.

Figure 4.1.: Dependency between teacher's technological knowhow, experiences with technology and their motivation to use technology in school

In the following example is explained how a teacher uses her own mobile device to enhance her teaching experiences. T2 also reported about usage of her smartphone in the classroom or outside the school on school executions in order to check out for information[20]. As part of projects, where children have to inform themselves about special topics and prepare a presentation for the class, the teacher goes on explaining these presentations have changed. Whenever children ask her questions on a particular topic she's not quite familiar with she uses her smartphone as an assisting device to retrieve information. In this occurance smartphones are used for teaching in a teacher's daily routine.

„When children ask me questions and are not familiar with something, I do not run to the laptop anymore, which is working too slowly and usually does not function, but I'm sitting on my table and have my smartphone in the palm of my hand and check up quickly for informations and give a response." (T2:310-313)

This suggestion also points out, the current situation and the way technology is applied within the classroom. The lack of deskbound computers can be understood, since there are in most cases old versions of computers available in the classroom, working slowly or not functioning. Under these circumstances T2 finds it reasonable to take her smartphone instead of the computer because it provides a simpler and safer usage. In this occurance it can be explained that technology is applied to enhance teacher's teaching experiences. Whereas she won't find it absolutely necassary to allow primary school aged children to get in touch with technology. T2 would find it more useful to apply technological devices shaping their lectures. This shows that technological circumstances are needed to guarantee a worthwhile usage for teachers.

„I should work much more with the computer..even in the classroom. First of all our computers are too slow and bad, that this does not function." (T2:259-261)

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[20] T2, line: 304, 308, 309.

„Internet access is not necessary for children in primary schools, I would prefer a beamer and a proper notebook with internet acces for teachers in every class." (T2:95-97)

On the other hand children in elementary schools should experience technology free learning activities. Concerning this issue T2 has the opinion of schools as technology free zones where the children in primary schools should have the possibility to undergo traditional learning methodologies, read a book, take a paper and draw something or move out in break time and take fresh air.[21] It can be seen that T2 is anxious about children getting in touch with technology. She have fears that children would not develop their social communication skills.

However there are also teachers finding it reasonable to provide children the possibility of using mobile devices and mobile learning applications in schools. T1 likes this idea very much and emphasizes on her willing to apply such technologies in school, once it could be provided in schools:

„Fears?? no no quite the contrary I would be pleased if my kids could have it, but I know it is not realistic at the moment, but I don't know what kind of worries I should have."[22] (T1)

These children don't have any fears, since they have experienced learning tasks with computers. They can control the amount of technology usage in the classroom and have arranged times for it.

In conclusion teacher's overall motivation to use technology in the class room depends on their technological knowledge and own experiences with technology in their daily lives. Furthermore there can be seen that teacher's shifting opinions about the way and the amount of technology currently used in the classroom relies on their general attitudes towards technology. Some teachers prefer it to talk about schools as a „technology free zones" where kids should be protected in their young ages. These teachers would agree on the idea of using mobile devices as supplements to enhance their teaching experiences. Other ones could imagine to use smartphones with pedagogically required applications as assisting devices for shaping children's learning experiences at school as well. However at the moment the only restrictions to guarantee a widespread usage of smartphones for educational content in schools are financial possibilities, since the goverment has to support them through funds.

4.3 Requirements and regulations to realize smartphone usage in the class

In the following an introduction to all of the requirements needed in order to apply smartphones for educational reasons in schools will be given. Financial feasibilities will be discussed as well as regulations to arrange the senseful usage of smartphones with pedagogically required applications in the everyday fabric of schools.

To have a widespread use of smartphones for learning content in schools firstly we are faced with financial problems. Thus the use of smartphones with educational applications can be

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[21] T2, lines: 261,266,267.
[22] see section 8.3.2.1 Interview Transcript Class Teacher– 3rd grades: 3A; lines: 248,249.

realized only with financial possibilities. The issue of financing mobile devices in schools is perceived by T1 as a big problem:

„..of course, this is one of the big problems." [23](T1)

In order to adress the lack of deskbound computers where children only have limited access, it is necassary to provide a single device for every child. Under this condition teachers would realize the advantages of using smartphones as assisting learning devices for children. Thereby other requirements must be fullfilled too in order to use smartphones reasonably for mobile learning experiences. Thus children must be kept under control so that they don't use these devices for different purposes than learning.

„..if every child would have a device (stressed voice), I could imagine, I would find it a good idea (laughing), although they wouldn't be allowed to use it as a mobile phone. The problem is of course, that very few children in my class could afford themselves a smartphone." [24] (T1)

„For that reason I couldn't apply it probably, but I could imagine to use it, if every child would have a smartphone (stressed voice)." [25] (T1)

„It will be too expensive in the near future, yes (stressed voice). Actually the time to apply it won't be yet, now there are only savings, but if it could be provided, than I could imagine that all of the children could look up on a topic and report other children about what they've read on their smartphone."[26] (T1)

As a conclusion the utilization of smartphones in schools could be arranged with governmental funds and sponsoring. Thus the widespread usage of smartphones for learning in schools needs to be adapted in every class.[27] T1 and T3 are assuming that this would be hard to realize in the near future and describe it as a dream of the future *„Zukunftstraum."*[28]

Regarding to these issues teachers could imagine to integrate the use of mobile devices for educational reasons. However, when the financial aspect is fulfilled, there are still other regulations to determine the use of mobile devices for learning.

The first aspect is about teacher's characteristics, their plans and the way how well they can deal with mobile devices. T2 is strongly recommending a teaching construction for teachers, to specify teacher's intentions and their goal and purpose of using smartphones with mobile applications in terms of school subjects[29]. There teachers have to indicate exactly for what they would use a smartphone to enhance their teaching experiences. Thus, a teaching construction is needed to enable a pedagogically reasonable and worthwhile appliance of mobile technologies for teaching. Furthermore teachers are needed who are capable to work

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[23] see section 8.3.2.1 Interview Transcript Class Teacher– 3rd grades: 3A; line: 227.
[24] see section 8.3.2.1 Interview Transcript Class Teacher– 3rd grades: 3A; lines: 52-55.
[25] see section 8.3.2.1 Interview Transcript Class Teacher– 3rd grades: 3A; lines: 59,60.
[26] see section 8.3.2.1 Interview Transcript Class Teacher– 3rd grades: 3A; lines: 178,179; 181-185.
[27] T2, line: 39.
[28] T1, lines: 64,111,177; T3, lines: 212,213.
[29] T2, lines: 352,353,358.

with mobile devices in order to have a pedagogically and socially valuable use of it[30]. Concerning this issue T3 would support the idea of providing continuing education courses for younger teachers, mentioning she would not be interested in it at the moment, because she will retire next year.

The second aspect explains the neccessity of specifications declaring the exact use of mobile devices for learning purposes. There teacher's monitoring and control is needed to distinguish between *where* and *when* these mobile devices are used by children; as well as *what* content these devices contain. Apart from that teachers have to agree on the age range of children and the grades where mobile applications would be adopted.

„..even if children are doing exercises, it would be horror for me if all the children would sit there in their school break and type something in their devices..so the use of mobile devices must be regimented under exact specifications." [31] *(T2:267-270)*

Children could experience mobile learning with their devices at school for an arranged time. T3's opinion on the official specifications for the duration of use is between half an hour and one school lesson, depending on what is done with the devices:

„I could imagine it very well to say that, in the first two school lessons of the morning, usual school work is done and after the long school break, the children could work from 10am until 10:30am on a training software, that was chosen by themselves or detemined by the teacher." *(T3:275-278)*

T3's approach towards technology appliance in primary schools shows the necessity of regulations determining the amount of usage:

„Even if the extent of usage is officially regulated..it shouldn't be permitted in any class, to work more than one school lesson on these devices..Thank God this can be comprehend. It doesn't work, if the eyes are caught on the devices all the time. We don't have enough time for that in school." *(T3:291-295)*

It can be clearly seen that T3 still has a careful approach perceiving primary schools as a protected sheltered-workshop *(„Geschützte Werkstatt")*. It is sure that children of this age range are needed to be treaten with care. This is an important issue to discuss with educators. In general teachers think that their responsibilities are to teach children basic knowledge and help them to grow up, evolving their social skills. According to this, there is a dependency between children's social development and knowledge, as well as the adoption of mobile learning software in schools. Hence children must be able to evaluate digital information in order to have a senseful appliance of their learning devices and support their social skills.

„Well I would utilise this in 4th grades more likely, before certaily not (stressed voice). So they get their basic knowledge in primary school. I think there's no use, if a six year old boy can surf and do whatever he wants to, when he doesn't know what to do with this wealth of information..but this is my personal opinion (in a low voice)." *(T4:121-125)*

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[30] T2, lines: 352,353.
[31] T2, lines: 267-270.

As a conclusion teachers recognize a need in mobile learning with smartphones from third grade and upwards[32]. Thus, the amount of technology used by children in the first two years of primary school should be very little or not at all.

A discussion about where to use mobile applications arises other key points. Mobile Learning with smartphones could be practiced in course of a new school subject. Children could do several exercises on their mobile phones given by the teacher. In addition children could take their mobile devices to practice at home. The last example is depending on the amount of control and mentoring needed during the task. T2 is suggesting that children could do all the training issues at home, at so called homework, where a teacher is not needed in person.

„Theoretically, it would be most clever, when they practice this stuff at home, because they really do not need my advise there, I must not sit there when they are looking into their smartphones. Actually this would be only a 'candy for school' but it would make a super story once it could be used in a manner for training at home." (T2:107-111)

Questions and other problems could be done within a follow up at school where children could get explanations from their teacher[33]. There traditional learning materials, e.g. paper and pencil will be used. Such follow up acitivities are described in former research within teaching architectures shaping the natural learning process. Schank & Cleary (1995) developed a representation of teaching methodologies supporting the workflow of natural teaching. They clarified all these attempts of teaching as accessible for computer implementation.
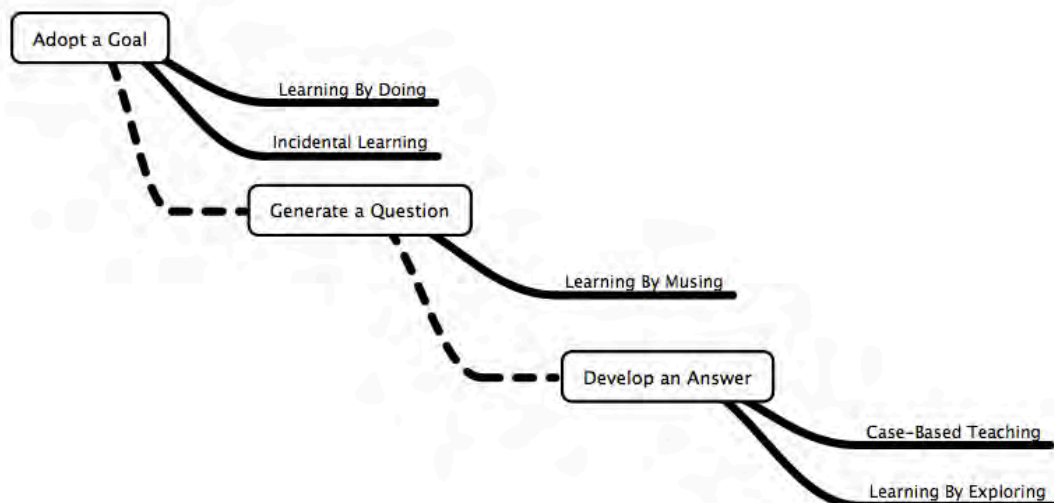
Figure 4.2: Teaching Architectures and the Natural Learning Process[34]

The *Natural Learning Process* is containing three phases. Firstly learners need to adopt a goal in order to gain knowledge. Secondly they get involved in the learning activity and begin to reflect their minds in order to generate questions. Thirdly teachers provide answers to learner's questions.

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[32] T2, lines: 258, 259.
[33] T2, line: 117.
[34] (Schank, Cleary 1995)

Learning by Exploring defines how children approach learning content through exploring their minds with question–answer sessions. As soon as children are involved into the learning task they typically begin to mull over their minds and questions arise.

„An important method of teaching is to answer a student's questions at the time he generates them and carry on a conversation with him, answering whatever follow-up questions he generates. The Learning-by-Exploring Architecture is intended to provide such answers in a conversational format." (Schank, Cleary 1995)

It is understandable that follow up activities become a particular part of the teaching process. Once children get involved into learning a subsequent period must be given to children for mull over their minds and reflect on learning tasks. Children should have the chance to recognize their problems and articulate them in an appropriate manner. Only under these circumstances children can improve themselves and become well informed self conscious adults. In this case teachers are key personalities to address the gaps of technology oriented learning. It is required to have interpersonal contact to students in order to understand their needs and to impart knowledge as best as possible. Thus personal contact will never be replaced by any kind of technological device. Consequently this matter is a big concern of teachers.

„..This all sounds fine, but what bothers me with this digital story, under quotation marks, is that the interpersonal relationship decreases.." (T4:71,72)

„The human being is more than an index finger typing on the mobile phone and it would be dangerous to reduce education on multiple choice or other things that could be adapted on a smartphone." (T2:215-217)

Thus we can comprehend that teachers have fears about loosing the communicational aspect of learning and teaching in the classroom. Especially in primary schools with young aged children this matter is of big importance and must be taken seriously. Hence mobile technology shouldn't be applied to alienate children from their social environment at school. Apart from that teacher's traditional teaching modalities must be appreciated in order to reduce teacher's anxiety on mobile technology usage in schools. All these requirements will be discussed in detail to understand them in chapter 4.6.

The diversity of mobile devices in the classroom could be the next challenge for teachers and children. Concerning this issue, an Extra-School-Device could resolve the problem of differentiated technology and provide a standardised tool with the same capabilities for every child in the classroom.

„Though many children will enter a classroom with some sort of mobile technology, the diversity of such technologies is astounding. One student may bring an iPhone, which touts a phone, Web browser, MP3 player, GPS, camera, and full-color touch screen among its many features. The next student may enter the same classroom with an older cell phone that has nothing more than calling and text-messaging capabilities." (Druin 2009)

The question of mobile devices with different technological capabilities has been recognized by T3:

„I have many foreign children, I have to tell you it's not always a matter of course, that the foreign children have the same accessories, sometimes the parents can't afford it. And if this could not be paid from the government, we would have class difference." (T3:109-113)

Governments couldn't probably provide iPhones for every class with at least twenty children, however a special standardised mobile device with educational content could be taken as a solution. Hence the charecteristics of such an Extra-School-Device make it the most appropriate tool which could be adapted for a widespread use in schools.

Another important topic where we have to emphasize to understand teacher's concerns on mobile devices for educational institutions is, what kind of content these devices should contain and the way it could be controlled by authorized persons, teachers. To avoid the misuse of such devices an own type of mobile education tools for primary schools could be developed. As solution to the above mentioned financing problems and as a help to determine the use of mobile devices in schools, e.g. *when* and *where*, came the idea of an own school device. Referring to this T2 came with the idea of an *„Extra – School – Device"*[35] explaining her visions on a special device designed for mobile education in schools where teachers determine what type of software can be installed there. Furthermore it should be a device where only educational school programs can run. However it should be designed similar to an iPod and attract children's attention.

„...it would be really fascinating, when there would be an extra-school-device, with which nothing else can be done..similar to an iPod, much more basic, less snappy, perhaps middle sized between iPod and iPad, where only school programs run. A simple and own device, which is perhaps a bit less cool, but interesting enough." (T2:124,125;127-130)

The Extra-School-Device would be like a school material, pocketed and taken to home[36]. With this device children would spare a lot of school material[37] which they usually have to take to school and which is reason to their heavy school bags. It would be a device enabling teachers to combine traditional and digital learning methodologies. Teachers would favour a software to prepare and edit working sheets for children[38]. They could add-in homeworks or school exercises which children would have to make with their notebooks[39].

An Extra-School-Device could also overcome financial barriers, because it wouldn't be used in sense of an entertaining and communication device like smartphones. Therefore it's shape and characteristics could be arranged with a lower budget. T2 went on explaining that such a device could be implemented in schools if the market price of it would be about 30 euros; 10

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[35] T2, line: 124.
[36] T2, line: 135.
[37] T2, lines: 135,136.
[38] T2, lines: 136,137.
[39] T2, lines: 138,141.

euros would be paid by parents through the purchase of schoolbooks and 20 euros could be sponsored. [40]

An additional feature of such a device could be in terms of using it for organizational issues. It could be carried at home and replace children's communication & information booklet. [41]

„I'm communicating with parents ninety percent through emails, we have an own account for commanation with parents. Nothing but ten percent is written in the communication & information booklet. So we could also let the children type in these things and use the device for communication with parents."(T2:187-191)

Based on the outcomes of previous research the difference between deskbound and mobile learning applications lies on the fact that mobile applications are used for shorter times. There the children are bound to foregrounded physical activities (Druin 2009). Thus the evaluation of this study shows, that teachers would permit the use of mobile devices in arranged times. Learning with mobile applications could be experienced within a new school subject where traditional learning methodologies would be combined with the support of digital devices. Children would use their devices between half an hour or one school lesson for the comparison of data or to retrieve information.

On the other hand devices could be taken at home, where training activities would take place without the presence of a mentor. Such training situations would enable teachers to monitor children's development of learning afterwards and create a reasonable follow up activity where children could ask questions about their exercises.

Finally financial feasible and attractive school devices for mobile learning could be designed to adress high economic costs.

4.4   Appliance of smartphones within a well defined curriculum

In this part of my thesis an introduction to teacher's ideas on possibilities for mobile learning with smartphones in schools will be given. It will cover areas where smartphones could be used in school lessons for given school subjects. Teacher's ideas for learning applications and the characteristics of pedagogically required applications will be outlined and discussed as well. The advantages of *Incidental Learning* will be discussed in the course of learning possibilities with playful applications. At the end teacher's recommendations on working with educational publishing for pedagogical applications building up on school books will be presented.

At the very beginning it should be mentioned that well informed teachers have more practical ideas on the usage of educational smartphone applications in schools. T3 and T4 were both educators with less knowledge about mobile applications and indicated these things within their interviews.

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[40] T2, lines: 157,158.
[41] T2, line: 186.

„..the questions is, how to apply it efficiently, therefore the teacher must be well informed about it." (T3:157,158)

„If I am not well informed as a teacher, I can not express a wish, because I don't know what is possible, so my younger peers are more informed about these things, I think from the age of 40 up or a bit older all the collegueas are overstrained." (T3:191-194)

*„Honestly I must say to you that I am overstrained, I have not dealt with that kind of subject yet, therefore I can't tell you, how I would make it, I have no idea about this subject. "
(T4:30-32)*

Nevertheless they were sure that mobile applications in schools shouldn't be used for amusement or playing games during school lessons. In such cases children could be disturbed through technological devices applied in school settings and loose their concentration. However T4 doesn't perceive mobile technology appliance in schools as a factor for disturbance once children work with their devices[42].

The characteristics of pedagogical required applications must be discussed in order to achieve an efficient usage of mobile applications in classrooms. Teachers with own smartphone experiences in their daily lives have a common agreement on the point that there could be all sorts of apps for training[43] children's skills and exercise programs. [44]

T2 having own practices with her daughter, using a mathematic application for *iPhone* to train her mathematic skills, could imagine to use similar application within a well defined curriculum for children in her classroom:

*„I could imagine it very well in a way of exercising (stressed voice)..Exercise is a good thing with programs, where I can call up, what has this child done in this week (stressed voice), ahm how well has he done it (stressed voice);and hopefully the same with an built in algorithm, that once there have been too many faults or it took too much time, that he has to do it again, so that he remains in a level (stressed voice). I could imagine it very good (stressed voice) for training and just for that kind of mathematic things, because it's pleasurable, all the children love to do it (stressed voice)..and ahm if you say now we have just twenty minutes mathematic training time, if there would be really a good precast mathematic program for training the mathematical skills (stressed voice), that fulfils the requirements of the curriculum (stressed voice), I could imagine it very well (stressed voice)."
(T2:65, 68-77)*

These sort of training programs would motivate children's practices in their learning tasks. Thus, children in the age group of primary schools could have a playful approach with learning. Hence we see that children would also appreciate the idea of providing children playful learning activities at school and they would not have to work with moaning kiddies finding learning a borring issue. But training programs would also provide teachers an ability to assess children's tasks and give permission to monitor and contol children's workflow. This aspect would support children too in helping them to develop their organizing skills.

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[42] T3, lines: 156,157.
[43] T2, lines: 68,76,79.
[44] T1, see section 8.3.2.1 Interview Transcript Class Teacher– 3rd grades: 3A; line: 74.

Apart from that children could experience autonomous learning and can do different tasks during a mathematic training time, independent from other classmates, e.g. children doing various exercises with different levels of difficulty, based on their skills and learning progress. Under these circumstances teachers could create more flexible lessons, coordinated to children's individual learning progresses, e.g. all of the children are working at the same time, in an arranged period during the school day, on mathematic exercises, some are training their skills in substraction, others are doing calculations to improve their additions,..

Furthermore teachers suggest mobile learning applications with levels and verificate that children already have an understanding of what levels are. In that way children's learning experiences could be designed playfully, motivating them to repeat a level whenever something has not worked very well. Referring to this, T2 suggests that children would do the same levels again, without complaining:

„Children comprehend what levels are and they also understand how many points they have got and how much time they needed, so that's very clear..I didn't beat the level in time, so I have to try again. Well if I would give a child the same spreadsheet for five times..the child and parents would probably have something against it. But I could imagine it as a way of practicing." (T2:84-89)

Children would be more likely to train their skills in the course of such learning applications with levels.That kind of a gaming approach, children are familiar with from computer games they play in their leisure times, could be applied reasonable to „play for learning" or to „learn for playing". The aspect of combining learning with games has been discussed in former literature:

„In today's education, the process of learning is rarely the motivating or engaging factor...Game playing, of course, is just the opposite. The main reason people play games is because the process of game playing is engaging. So engaging, in fact, that I would argue that computer and video games are possibly the most engaging pastime in the history of mankind. These games bring together combination of motivating elements not found together in any other medium..Because of all these factors, combining games and learning can potentially add enormously to the motivation of students to learn what they may not be otherwise motivated to learn, and increase their engagement in the learning process. How? For a start, fun in the learning process creates relaxation. It enables them to put effort without resentment." (Prensky, 2005)

The advantage of games motivating children has been understood in the past years and researchers aksed themselves why this issue can't be used in order to achieve a learning success. Such learning activities could be shaped with more pleasure for learners as well as for teachers. They argue that it makes sense to combine dry topics with more exiting content, where it is hard to teach and children find it difficult to understand and learn. Otherwise teacher's punishment is needed and children are getting annoyed and can't be motivated for working anymore.

„If there could be also exercises for training reading (stressed voice), where one has to read a text and answer multiple choice questions..and it makes a ‚Yippie Yippie' if the answer was

correct and a „Weou Weou ' if it was false, motivation is a big point (stressed voice), where we could work better with less thrilling things. This is absolutely the advantage (stressed voice)" (T2:205-210)

We can see that children can be easiliy motivated to learn with games and have a remarkable learning experince with growing technological possibilities. All these are indications that are showing us firstly how today's learners have changed and secondly the way different approaches like gaming could be used in order to motivate children for learning. Nowadays children are no strangers to technology, instead they are growing up with all sorts of digital technology. They play computer games, use instant messaging and have experiences with their own smartphones or their parent's tablets. Children are famiłar with numerous mobile applications used for gaming, familiy & fun, communication, education, entertainment and much more. Hence this little human beings know much more than we as adults are assuming them to.

„..today's learners have changed in some fundamentally important ways. Growing up with digital technology, of which computer and video games are a major part, has dramatically – and, importantly, discontinuously – changed the way people raised in this time think and process information." (Prensky, 2005)

Children follow the last state of technology. Whether every child in our study has a smartphone or not, they are interested in smartphones, because it's in, it's in everyones mind and children see it everywhere on people's hands on their daily way to school. Concerning this point teachers are also aware of the fact that technology has a big deal on children. They have realized that technological devices have always been an issue to raise children's motivation. From television to deskbound devices as personal computers for entertainment & internet, mobile phones for text messaging & telephoning and at least smartphones used in numerous ways. Smartphones are the latest technology with widespread use and a great popularity among children, which makes them the most suitable devices for mobile education.

„We have to motivate somehow children for working and in this case the issue of motivating is no longer necessary because the device does it (stressed voice), it brings the motivation, the computer brings motivation it's inside the computer, in the past it was the television..now it has become out..I think the motivation lies in the smartphone as well (stressed voice), if the kids have a device and are bored, than they make something useful..(laughing) In this way we make them learn in a hidden way, that's what I find good (laughing)."[45] (T1)

With the presence of mobile devices children need something new to motivate them for learning. Therefore smartphones with educational applications would be a suitable technology which can be adopted in schools for a widespread use. Regarding this, a raise of children's motivation in mobile learning will be achieved with smartphones and appropriate learning applications with games. The feeling of happiness children would obtain once they would have completed a level would be a crucial factor for their upcoming learning success. It is also a significant point, influencing children's overall approach towards a school subject and

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[45] T1, see section 8.3.2.1 Interview Transcript Class Teacher– 3rd grades: 3A; lines:132-140

defining if children have fun to calculate and like a school subject, or if they have established fears and it is annoying for them.

A playful approach to engage children in learning activities is explained in T2's own experiences:

„My daughter has an application, once she does quickly enough, much enough calculations correctly, she is allowed to dress a puppet and buy clothes with the money she earned through collecting points, and she can even buy a dog..everything because she is training mathematic calculations yes (stressed voice), so it seems not like training mathematic calculations, instead dressing a puppet, besides she makes exercises...and that's a great story (stressed voice) – ‚Supergschicht' – because once children would begin to do exercises regularly, it would be good for all, yes." (T2:199-205)

It can be seen that teachers appreciate the idea of engaging children with playful mobile applications for learning. With learning games children don't feel like training mathematics or vocabulary, instead they are part of a digital game trying to beat the level. In that way children primarily find themselves unaware of learning a task, rather than they are gaining knowledge in background while they are doing ordinary things, e.g. singing a song about the alphabet. This phenomenon is described in Schank & Cleary's teaching architectures (1995) as *Incidental Learning* (see Figure 4.2):

„Obviously, not everything is fun to learn. In fact, some things are terribly boring to learn. But people do habitually learn a variety of information that is quite dull, without being completely bored by it. Often, they do this by picking up the information ‚in passing', without intending to learn all the information at all. The Incitendal Learning Architecture is based on the creation of tasks whose end results are inherently interesting, and which can be used to impart dull information. We have built programs that impart incidental information while engaging the user in a fun and interesting task."[46]

The advantage of *Incidental Learning* has been identified as the most decisive point to engage learners as well to address the gaps of traditional teaching. Children often have problems with memorization of knowledge and dull facts. It would be more useful for learners to gain well indexed knowledge within a context they can relate. Thus is the respobsibility of educators to create a knowledge-centered classroom with natural activities that enable children to learn things in passing. Thereby children shouldn't be motivated with extrinsic motivation, that is used in traditional teaching modalities, narrowing children's interest in learning content. Whenever extrinsic motivation is used in education the workflow of natural learning does not contain all phases (see Figure 4.2). Thus the sense of learning does not occur correctly. Children develop goals, but their mean achievement is not to learn knowledge, rather to win the prize offered by the teacher. In conclusion children are failing to reflect on the learning topic without generating any questions to be answered. Instead they are trying to resolve the task quickly with less amount of effort. Finally when they have achieved their goal, they no longer are motivated to retain information they have „learned". On this occasion Incidental Learning can resolve the problems of motivating children for learning content through learning in context. We can see how knowledge can be gathered the best way with natural learning activities children experience in passing. In this case intrinsic motivation lies on the learning activities shaped with a playful approach as well as the use of mobile devices.

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[46] (Schank, Cleary 1995, pp.70)

„The important premise behind incidental learning is that when a student is doing something that is fun, he can be learning a great deal without having to notice it. Learning does not necessarily have to be jammed down a student's throat. Rather, students should be allowed to adopt goals and be given materials that will cause them to pick up the desired information ‚in passing'. It is up to course designers to construct situations in which factual knowledge can be naturally acquired. This is the basis of Incidental Learning Architecture. "[47]

In order to create those kind of learning activities children have fun about and supporting Incidental Learning we need to know what children are interested about. This gives reason for working with children as design partners and exploring ideas about mobile learning applications.

Mobile learning applications for primary school can be adjusted to all kinds of school subjects. Hence teacher's proposal for learning applications can be distinguished by school subjects, generally applied in Math, German or *Sachunterricht*. Exercise programs in Math could be used to improve children's calculating skills, containing different kinds of calculations, substractions, additions, one's tables and divisions. Thus children would experience learning without being aware of it and take their smartphones to play useful learning games when they get bored.

„There could be mainly exercise programs, for example multiplication tables.. because children play Nintendo every now and then when they are bored...the last time they were allowed to play it while they were sitting there during school break..their concentration was lying on the device. So they play Nintento if they are bored and I would find it a clever idea if they would do something useful. Regarding this, they would play a multiplication game for sure or additions, substractions.., depending on their ages..to improve their skills in mathematics. "[48] *(T1)*

In order to design reasonable mobile learning applications for schools, we need to know what is pedagogically required and what kind of learning content should be adressed with these apps. Concerning this issue a collaboration with school book publishing should be done for increasing the efficiency of mobile applications. In that way children's ubiquiotous learning experiences could be coupled with school book content that has to be teached for given school years. At this point T1 has a suggestion:

„A spelling program for German..in every chapter of our school book we have vocabulary to learn. If the spelling program could be build based on the school book, that would be ideal (stressed voice). We would have to cooperate with school book publishing, because they have CDROMs for learning already based on the school book. There is also the possibility to use the loudspeakers for writing a dictatation, with suggested corrections.. "[49] *(T1)*

„In the course of ‚Sachunterricht' we have a focus on different topics, e.g. now our focus lies on Romans.. as I have a teaching profession in computer science, I have programmed a Web about Romans and Vienna..I would have an idea on this, it's a dream of the future, all the

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[47] (Schank, Cleary 1995, pp.97)
[48] T1, see section 8.3.2.1 Interview Transcript Class Teacher– 3rd grades: 3A; lines:74-84.
[49] T1, see section 8.3.2.1 Interview Transcript Class Teacher– 3rd grades: 3A; lines: 93-95.

children have smartphones, they are working on an app where they can see...well this is just my own idea (laughing)..where they can see how the world empire of the Romans has been expanded. There is a map where it is marked which of these sights still exist today.
I have done a Web like that and I could imagine an application in a similar way. I'm sure the kids would do this (stressed voice) and I'm convinced that it would durely arrive..yes (laughing)." (T1)[50]

That kind of applications as mentioned above would enable children to benefit from the tangibility of smartphones in a way they could directly influence simulations on the display. Smartphones would address natural learning with the possibility of exploring and experiencing changes in history right in the palms of their hands. These aspects of learning have been described in former research. *Simuation-Based Learning-by-doing* is represented in Schank & Cleary's (1995) Teaching Architectures (see Figure 4.2):

„This architecture aims to have students learn every possible skill through learning by doing. Because the doing of the task is what prepares the student for real life, it is important that the student be able to actively engage in such tasks. Simulations of all kinds can be built. But the designer must understand the situation well enough that the simulations will be accurate portrayals. This can mean, in the case of simulations of people-to-people interactions, having to create complex models of human institutions and human planning and emotional behavior. The Simulation-Based Learning-by-Doing Architecture is critical when the subject matter to be learned is experiental at heart. Much of natural learning is the accumulation of experience."[51]

Simulation-Based Learning-by-doing enables learners to experience learning content. The learner finds himself actively working on the simulation to change it's outcome. Those kind of simulations would be appropriate within the school subject „*Sachunterricht*", where different topics about real life are carried out, e.g. natural science, history, geography. Depending on the focus, all sorts of simulations could be designed, e.g. a simulation on Roman history as mentioned above. Finally children's active involvement in simulations would serve for intrinsic motivation and engage children to accomplish a learning task.

To sum up, the analysis of this work is showing teacher's overall ideas about mobile learning. We can compare teacher's different ideas on mobile learning applications for schools and emphasize on their approaches towards the appliance of mobile technology.

Firstly, the need of mobile learning applications for any kind of practicing at school has been identified. Concerning this issue, teachers agree on a reasonable appliance of mobile learning applications to improve children's skills. Exercising and training programs are always an issue of interest for teachers. Different applications should be designed for given school subjects where the main focus in primary schools lies on Mathematics, German or *Sachunterricht*. In order to develop pedagogically desired applications a collaboration with school book publishing is necessary to meet the requirements of a well defined curriculum.

Secondly, teachers have recognized the importance of mobile devices to create a knowledge centered classroom. Teachers have noticed the benefit of mobile devices motivating children for learning content. Thus they appreciate the idea of using smartphones as a trigger for intrinsic motivation. Furthermore they have realized the possibility of combining useful

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[50] T1, see section 8.3.2.1 Interview Transcript Class Teacher– 3rd grades: 3A; lines:104-114; 116-121.
[51] (Schank, Cleary 1995, pp.70)

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learning content with mobile applications in order to enable *Incidental Learning*. Thereby teachers emphasize on the reasonable appliance of mobile devices for Incidental Learning whenever children get bored.

Thirdly, teacher's approaches towards the amount of mobile technology applied in the classroom is shifting. All of them agree on the fact that there must be formal specifications to declare *where*, *when* and *what for* smartphones would be applied in schools. The following table represents an overview to shape the boundaries of mobile learning in primary schools.

Where?	When?	What for?	What is required?
At school	During school hours; predetermined times, e.g. between half an hour and one school lesson	Exercising programs for school subjects, e.g. German, Math, *Sachunterricht*	1. Widespread use of smartphones at school. 2. Teachers need to define exact specifications to declare the field of appliance of smartphones. 3. Devices where only educational content functions.
At school	During break time	Playful exercise programs motivating children, incidental learning	1. Widespread use of smartphones at school. 2. Teachers need to define exact specifications to declare the field of appliance of smartphones. 3. Devices where only educational content functions. 4. Playful learning programs with educational content
At home, where the presence of teachers is not required	In children's leisure times	For homework, children retain worksheets	
Outdoors, school executions	During school hours	Narrative Learning, Storytelling Activities, Content Creation	Creative Learning Environments

Table 4.1.: Specifications should determine the usage of mobile devices in schools

4.5 Advantages of using smartphones for learning content

In these sections we will evaluate teacher's thoughts about the advantages of smartphones for mobile learning in schools. The following representation gives an overview of teacher's opinions:
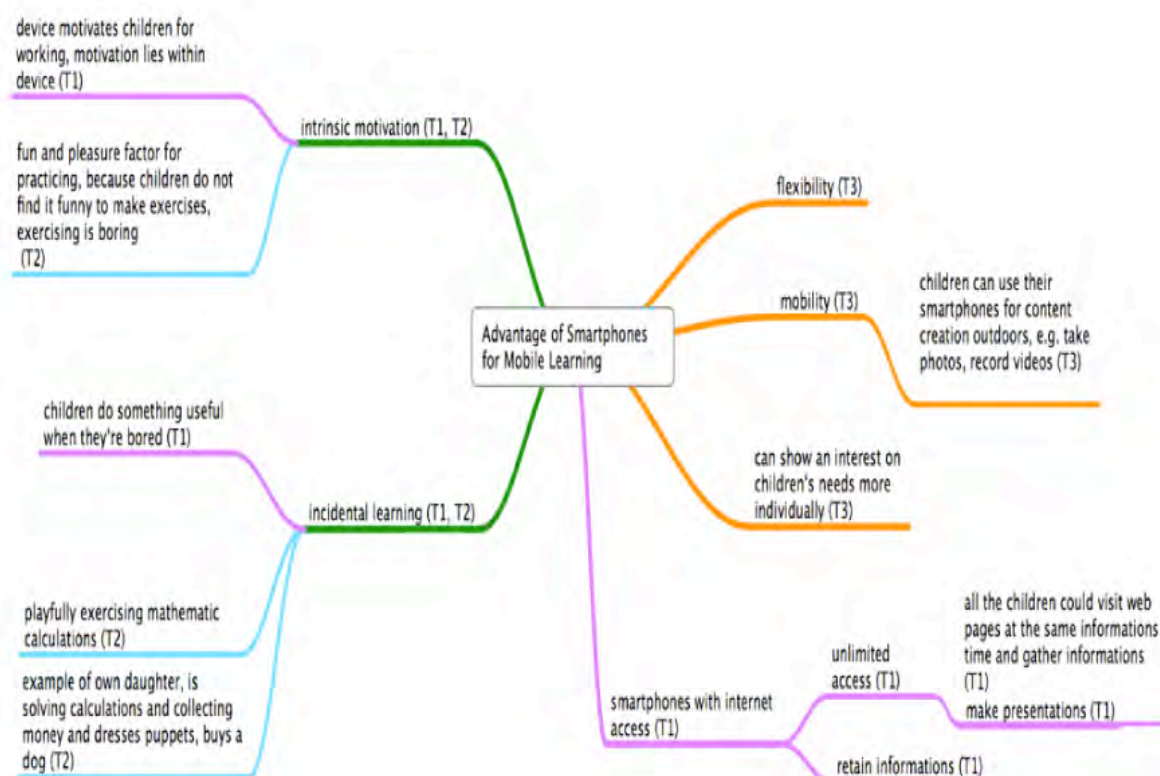

Figure 4.3: Advantages of Smartphones for Mobile Learning

It can be seen how teachers T1 and T1 commonly identified *Intrinsic Motivation* and *Incidental Learning* as the key advantages of smartphone usage for educational content. These issues have been already discussed in chapter 4.4.

Furthermore T3 noticed an increasing amount of flexibility and mobility through appliance of smartphones as portable devices instead of deskbound computers. Thus flexibility would enable teachers to individually look after children and understand their needs. On the other hand children could become more autonomous learners and have individual practices with training programs on different topics depending on where their skills are needed to be improved. Mobility is an advantage supporting *Ambient Learning* and *Narrative Learning Environments* also mentioned in chapter 2.4.4.

Apart from that smartphone usage with internet access would be definitely an advantage for T1, whereas other teachers, e.g. T2 don't find it necessary to have internet access for children in primary schools. However this would limit all the possibilities of using smartphones for equal access and retain information in the classroom in order to create a knowledge centered space. Hence T1 notices the way children could prepare presentations using their smartphones to look for information. Once again there is a financing question for the widespread use of smartphones with internet access in schools in Austria.

4.6 Teacher's concerns and prejudices on technology appliance for children

Teachers are key personalities for integrating smartphones into the everyday fabric of schools. Hence we need to understand their doubts and anxiety about technology appliance in primary schools in order to resolve existing bariers and reduce their prejudices. As we have already discussed in chapter 4.2, teachers who are well informed about technology having own smartphone practices don't have much fears about technology. T1, who has a teaching profession in computer science explained how well she is capable of technology and stated that she does not have any kind of fears and prejudices. Instead she would desire such mobile learning technologies and appreciate it if her kids could use it. On the other hand T2 is also capable of technology, whereas she has own practices with her six year old daughter who improved her skills in mathematic with mobile learning apps on the smartphone. Even though T2 has noticed that such positive outcome could only happen through smartphone technology she has still worries about technology appliance in her classroom. In general she has the opinion of primary schools as protected areas where young aged children should gather basic knowledge with less use of technology. T2 reports, that human beings are more than machines and emphasizes that children in young ages need to develop communication and social interaction. It can be seen that teachers main prejudices lie on the fact that technology appliance in schools could alienate children from their environment and social interaction. As a result T2 and T4 think that interpersonal relationships should be in the foreground and come firstly. T2 emphasizes on the importance of collaborative working in her classroom and states:

> „Everything you say is great, however I always have a big BUT, yes the big BUT which is together the commonness instead of the individual."(T2:326,327)

We can see that T2 as an educator has developed a sense of protecting children in her class from technology. She thinks technology seperates children influencing their social interaction in the class.

> „The idea of 25 children all of their views caught into the smartphone, instead of having a field trip together...usually they are talking with each other and are chatting together and make foolish things together, and all these are things they should do now. And not staring into something..hence I would more likely imagine to have an iPad for the classroom and we can watch a film while we are standing somewhere (during the excursion) and gather information..this would be all great.." (T2:316-325)

T2 has fears that children's social communication is getting lost through the use of digital devices. On the other hand children are in need of teacher's caregiving and monitoring and as we as human beings are more than mechanic devices. Thus teacher's doubts about technology alienating children from their environment is understandable.

Moreover T2 is thinking that young children in primary schools could not live of their childhood and enjoy time in the nature with fresh air, once there is technology applied in primary schools. Regarding to this she is talking about primary schools in Austria as technology free zones:

„I think there should be still a technology free zone. In Austria primary school is left with ten years, somewhere else primary education ends up only at twelve years. At our institution children are already in the wild with ten years, then it goes on. And it's a quality we have here in Austria in our society in our schools, that there is somehow a protected workshop (‚geschützte Werkstatt'). And I think technological freedom is almost necessary."

(T2:261-266)

In such protected workshops young aged children should learn basic knowhow and develop their socializing skills.

Another prejudice teachers have is that children use any kind of technological devices only for gaming and entertainment. They think gaming would harm children's concentration and disrupt their learning experiences. This issue has been underlined in previous research too. Roschelle (2003) recognized the advantage of mobile devices enhancing education and knowledge in the classroom, however he has also identified the changes mobile devices can cause within the classroom and stated that technology appliance can cause disruptive behaviour and violate social patterns. Hence teacher's anxiety on this issue can comprehend:

„Actually it is used only for gaming purposes, I'm not in favour (laughing)." (T4:50)

„I think at the present time where children spend a lot of time alone, there wouldn't be a controlled access, instead an excess of games."(T4:98-100)

Finally all these issues point out the importance of regulations to determine the use and amount of mobile devices in schools.

„Immoderateness and excessive use is always a doubt. I mean of course, if there are iPads instead of smartphones; where only educational content is loaded, and where there is perhaps a docking station, where every child is in charge of his device and it has to be placed there at the end of the schoolday; and I can call up exactly what one has done with it,..well internet access is not necessary for children in primary schools, I would prefer a beamer and a proper notebook with internet access for teachers in every class...ahm but if it is only used for learning games, I can imagine it very well; than there's a docking station and the kids must take care to place their devices there at the end of the schoolday..well than there would be probably also somehow arranged times for use..." (T2:91-100)

4.7 Teacher's ideas on learning outdoor with smartphones

A particular quality of mobile learning with smartphones is to shape teachers and learners experiences on outdoor fieldtrips. The portability of such devices enables them to take advantage of ubiquitous learning and teaching. Teachers are aware of the emerging new possibilities through the use of smartphones in contrast to deskbound learning activities. Regarding this issue, T2 described her ideas about a reasonable appliance of mobile learning devices in the course of educational excursions. However she also explained her concerns and

doubts on mobile technologies alienating children from their physical environment and reducing communication.

Smartphones enable a broad field of appliance in the course of narrative learning environments in physical spaces and field trips. In this area examples from past research have been already given in the chapters 2.4.4 and 2.4.5.

In this chapter I have investigated teacher's approach towards the appliance of mobile technology outside the establishments of primary schools. Teacher's ideas on learning outdoor with smartphones indicate that they are aware of the flexibility and mobility of learning content. First of all smartphones can address the lack of deskbound computers and provide children an equal access. Children can use their devices to retain information right in the palm of their hands. Apart from that, teachers find smartphones as useful devices for content creation & distribution. Children can upload their experiences on school excursions on the webserver and inform their parents about these happenings. Smartphones can be also used on trips to engage children's creative writing. T2 gives an example for combining children's journal entries while they are on school excursions with their smartphones in order to have digital storytelling and narrative learning.

„We have project weeks. It would be theoratically cool of course, if everyone would have their device slinged on – but this has to be an appropriate and solid device for children – yes everyone would have their devices slinged on, to make photos at any time and they would type in their journal entries on the evening – whereby I would prefer it if they would write it down instead of typing it, nonetheless they could make a journal entry out of all photos and describe things they find important, that would be a great thing, yes. Ahm (pause)..there are manifold possibilities." (T2:337-344)

The main problem concerning the use of mobile devices has been identified as a danger. Teachers understand how well smartphones could be integrated into fieldtrips to museums or project weeks. However they are dissatisfied with the idea of children caught into their devices all the time with limited social and environmental interactions:

„Yes all of these ideas are great. We are dogs as human beings so to speak (‚Wir Menschen san Hunde sozusagen..') and we find it difficult to assess and limit the amount of technology..the amount of discipline required of teachers, that it is not ok that everyone on the fieldtrip is staring into their devices the whole time, even when they read something about Mozart ten times, whose memorial we have seen yet, because they should not stare into the screen, instead..so it's difficult. So a teaching construction is recommended , determining how much one is capable of it and the way of having a pedagogically and social worthwile appliance of it. It's really fascinating principally." (T2:346-354)

In order to have a reasonable use of smartphones for both parts, teachers and children, the amount of appliance must be controlled. This issue lies on the responsibilities of teachers and is characterized through teachers knowhow and ability to monitor children. Finally it can be seen that interpersonal relationships and communication are in the fourground. These are all

social experiences children should encounter at school. Thus the appliance of smartphones follows afterwards and is a special treat.

4.8 Teacher's Suggestions on a Mobile Learning Framework
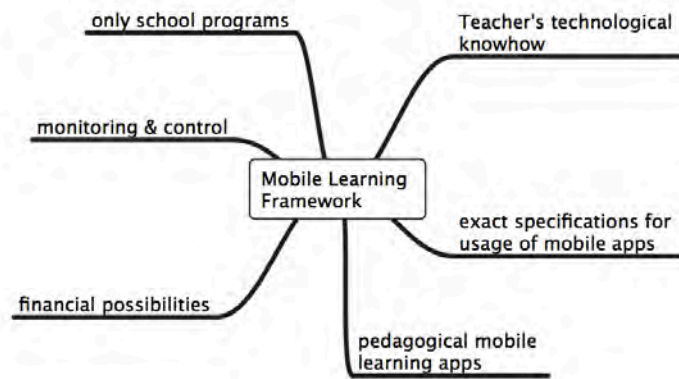
Based on the outcomes of former chapters, we can summarize teacher's recommendations for mobile learning on a framework.

Figure 4.4.: Mobile Learning Framework

First of all we must ensure of financial circumstances to have a widespread usage of smartphones in schools. Furthermore it is required to have well informed teachers with pedagogical responsibilities in order to have an effienct usage of mobile learning technologies with smartphones. Within the formal boundaries of a school we need to have regulations in order to determine the way smartphones with mobile learning apps would be used in schools. These specifications should emphasize on the following points: *where* handheld devices are used, e.g. in school, home for homework, outdoor on fieldtrips; *when* devices are used, there must be arranged times, e.g. between half an hour and one school lesson; *what for* devices are used, we need to have curriculum specified tasks to have a learning-centered classroom.

Apart from that pedagogically desired mobile learning applications are needed to be developed in collaboration with teachers and children. Teachers ideas on mobile learning applications involve all kinds of traning applications combined with learning games to engage children for learning content and benefit from the advantages of *Incidental Learning* with mobile devices that are motivating children. Thus there need to be smartphones where only school programs function to control the way mobile devices are used in schools. Apart from that mobile learning applications are needed to be developed that enable teachers the ability to monitor children's improvements in their learning tasks.

5 Evaluation of Participatory Design Workshops with Children

In the course of this thesis, *Participatory Design* was choosen as a qualitative research methodology to be applied with primary school aged children in Austria. This methodology took place within ethnographic research to explore ideas about children's mobile learning applications. Thus children actively participated as design partners and shaped teacher's recommendations and ideas on mobile learning apps as we have discussed in chapter 4. Thereby 5 participatory design sessions were hold in calender week 21/2012 with children at primary school St. Elisabethplatz, Vienna, Austria. The design sessions were arranged with a total number of 37 participant children, including 18 students from third grades and 19 students from fourth grades. The research was carried out in the establishments of the school and children's design groups were arranged in agreement with their class teachers. The following table 5.1 gives an overview of all participatory design sessions:

Class	Gender	Participants	Data collection	Duration	Collected Design Sheets
3A – Group 1	4 female, 4 male	8 children	audio recordings, digital photos, children's design sheets	50 minutes (1 school lesson)	8
3B – Group 1	7 female, 3 male	10 children	audio recordings, digital photos, children's design sheets	50 minutes	14
4B – Group 1	2 female, 5 male	7 children	audio recordings, digital photos, children's design sheets	50 minutes	9
4B – Group 2	3 female, 5 male	8 children	audio recordings, digital photos, children's design sheets	50 minutes	8
4B – Group 3	3 female,	4 children	hand written	30 minutes	4

	1 male		notes, children's design sheets		

Table 5.1 Participatory Design Sessions

Participatory Design workshops were carried out in a social context with participant children & an instructor as actors and within formal boundaries. At the beginning of all design sessions I picked up the children from their classes. All design workshops except one where conducted at the music room, which was the room of assistant teachers. One design workshop (3B Group1) took place in the class 4A. Due to the fact that the classroom of the class 3B was occupied during that time, the workshop needed to be held on in a different place. The class teacher of the class 4B was a kind person to help me find out another classroom, 4A was free on that time where the children were in gym class. I as the instructor was a strick person, paying attention to the properties of the class 4A and their student's materials not to get harmed. When B1 and G6 (3B – Group 1) were touching the paper decoration, flying paper birds hanging around, I kindly told them to stop.

In the following section, the conditions capturing all design workshops with children will be discussed in more detail. We will emphasize on children's social interaction and activities among themselves as well as their communication with the instructor. This will help us to understand children's different expectations about smartphones and how these could be used in schools. At the end of this chapter children's design documents of particular interest will be introduced.

5.1   The process of working with children as Design Partners

In the course of participatory design workshops I have gained many experiences on working with children as design partners within the formal boundaries of a school. Thereby I observed children's communication during the workshop and distinguished several forms of interactions with children as actors in the social context, e.g. every now and then discussions between classmates arose or they had quarrels.

Moreover children were given a brief introduction of myself as a person and my research topic in the beginning of each participatory design workshop. I explained my interest to work with them and why I needed their help. General information on the task was given so that children knew in which areas I needed their ideas. Thus they understood the importance of our collaborative work. Apart from that children shouldn't be shy to ask questions whenever they wanted to and there were no restrictions on their imagination. Though their design documents should be shaped of general boundaries, e.g. children's daily experiences with smartphones, what kind of applications they liked, their ideas on using their smartphones in school for learning content and drawings of their mobile learning applications. Within these boundaries, children were free do design or write whatever they wanted. Additional storytelling activities were appreciated too. Once the sense of these design workshops was explained, children were excited and had numerous questions to ask about the task, e.g. they wanted to know what kind of things they were allowed to draw.

Detailed examples of children's questions and descriptions of their social interactions can be found within the enclosed CD-ROM.

5.2 Children's embodiment with smartphones

Children's embodiment with smartphones and the way they use it is an interesting aspect for understanding their experiences with smartphones in daily life as well as what kind of applications they use. Moreover children use their smartphones as assisting devices to interact with their friends. All these issues are important in the course of designing mobile learning applications for smartphones. It has been evaluated that children use their smartphones for interaction with friends for the purposes of content creation and content distribution. Thus revealed how children enjoy it to create and share media content with friends. These aspects are of special importance for *Narrative Learning* and *Learning on Fieldtrips*.

When the children were asked questions about their smartphone practices, they were permitted to use their smartphones in class during this design session. In that way the instructor allowed them to do activities they're usually only allowed to do at school break. Concerning that point class 4B is the only class among all students of primary school St. Elisabethplatz where the class teacher T3 allows the children to use their smartphones or other similar technological devices like gaming consoles and *PSP* at school break. Hence in this participatory design session the instructor paid attention not to restrict children's behaviour in use of technological devices and carefully observed how children embodied their smartphones. These occasions happened in the natural settings of a school and children were free to take their smartphones from their pockets and do whatever they wanted to. It has been revealed that children used their smartphones or mobile phones during the design workshop in the course of three points: *to interact with friends*, e.g. showing them applications; *to share media content with friends*, e.g. videos they have made on their smartphones; *for content creation*, e.g. make photos of their friends, record videos of fooling kids.

4B – Group 1:

During the design workshop G1 took her smartphone from her pocket when she has finished her design document. She made use of her smartphone to interact with her friend G2. G1 shared her smartphone with G2 when she was showing her a Worldtimeapp she has installed on her device. G2 asked her friend two times if she could take it in her hand. Thus G2 could also experience this application. When G2 needed help about the device G1 kindly helped her. Once G2 asked how to scrawl downwards to the end of the screen (7:273,274) and both compared the time on earth and made comments about it (7:267,268, 271). G1 and G2 had fun when they were caught in this application on the smartphone of G1. They also showed their experiences with Worldtimeapp to the instructor.

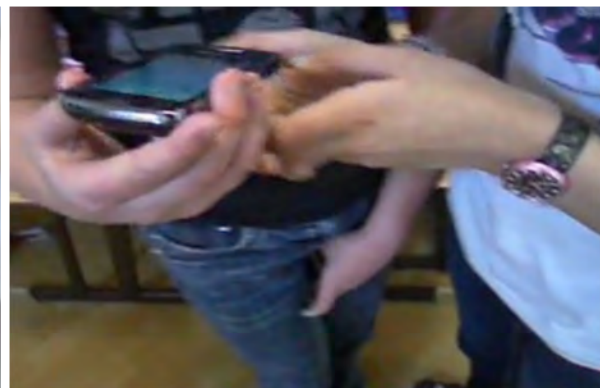Figure 5.8.: G1 holds her smartphone showing G2 Worldtimeapp   Figure 5.9.: G2 askes G1 if she could try it on her own
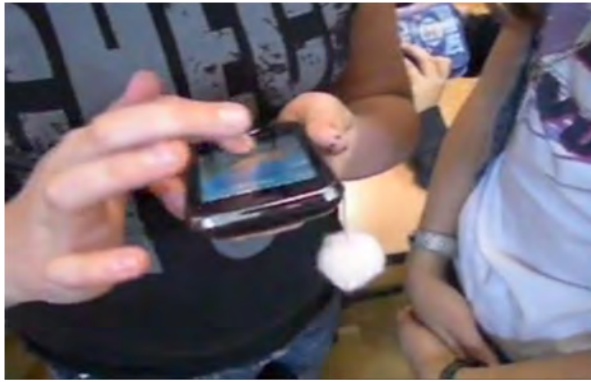
Figure 5.10.: G2 takes G1's smartphone

Figure 5.11.: G1 shows G2 how to scrawl down

4B – Group 2:

In this design session the children used their smartphones to interact with their friends too. G1 introduced her friend an application she uses often on her smartphone, it is called „*Lesen in Zukunft*". When she told her classmates that she could see the future by using this app, all other children (B2,B3,B4) wanted to have a look on it (2:45,46,48,49,50).

Other children used their smartphones for sharing content with their friends. B1 had practices with his smartphone, once in a while he showed his friends interesting media on his smartphone. He always gained the attention of his classmates, those were excited and grouped by B1's side. Some of the children were sitting on the desks to have a better view of the small screen on the hand of B1. B1 mentioned that he used his smartphone to make videos of his cat. He showed these videos to his friends (10:424,425).

Figure 5.12.: B1is showing his friends videos of his cat which he has recorded on his smartphone

B1 also showed his friends a logical game on his smartphone he was holding in the palm of his hand, B2,B3, B4 and B5 were grouped around him with much excitement (10:445).

Figure 5.13.: B1 interacting with this friends through his smartphone

On another occasion B1 played his favourite music to his classmates on his smartphone and B3, B4, B5 were listening to it standing by his side (10:404). Apart from that children took their smartphones for content creation, e.g.

54

recording videos of friends, make photos of friends, recording audio voice. When children were fooling around, one time B1 took his smartphone to record a video of his friends making funny faces (10:412,413). At another time B2 told B1 to take a photo of him (5:193).

Figure 5.14.: B1 taking a photo of B2 with his smartphone

5.3 Analysis of Children's Design Documents

In this chapter an explanation of the analysis of children's design documents will be given.

5.3.1 Approaches shaping children's design documents

In order to analyse the outcome of children's ideas on mobile learning applications we need to understand the way children approached mobile learning and smartphones in general. Children used different approaches to design their documents. We have already indicated that some of them worked with devices and brand names whereas others only drew applications without any devices. Children also combined their design sheets with story telling activities. They told stories about the way they use their smartphones in their lives. Others could imagine to use their devices for special school subjects or learning outdoor school executions and designed their mobile learning applications. Finally children felt like inventors of their own smartphones and developed an understanding of smartphones as devices for multipurpose use to combine their favourite mobile applications. All these issues will be named in the following parts.

G1 and G2 (4B – Group 1) both took out their mobile devices to draw on their documents. G1 made a drawing of her smartphone with the brandname *Samsung* and wrote a brief story introducing her device:

> *„From time to time I'm listening music on my handy and play games. Formerly my handy belonged to my sister but she got a new handy and I wanted to have her old one that much, therefore I got the old handy."*
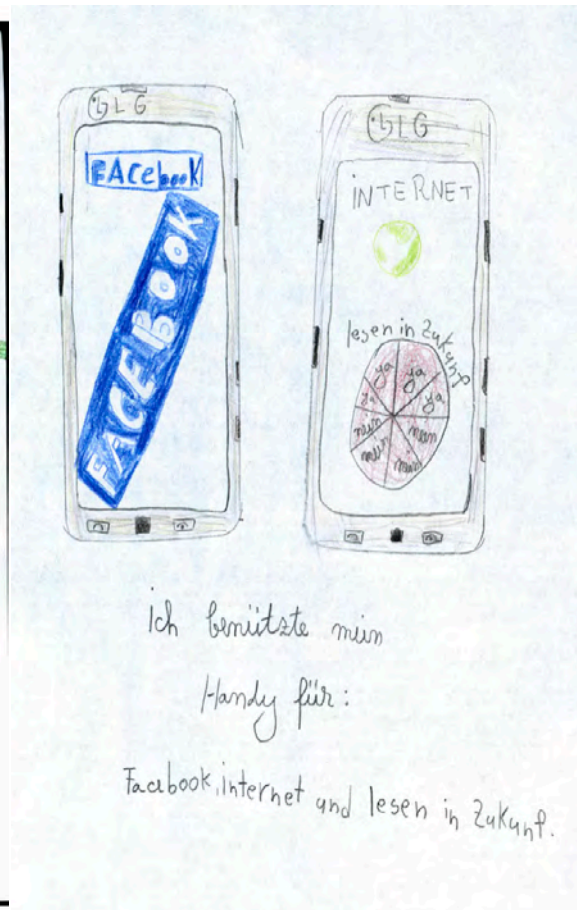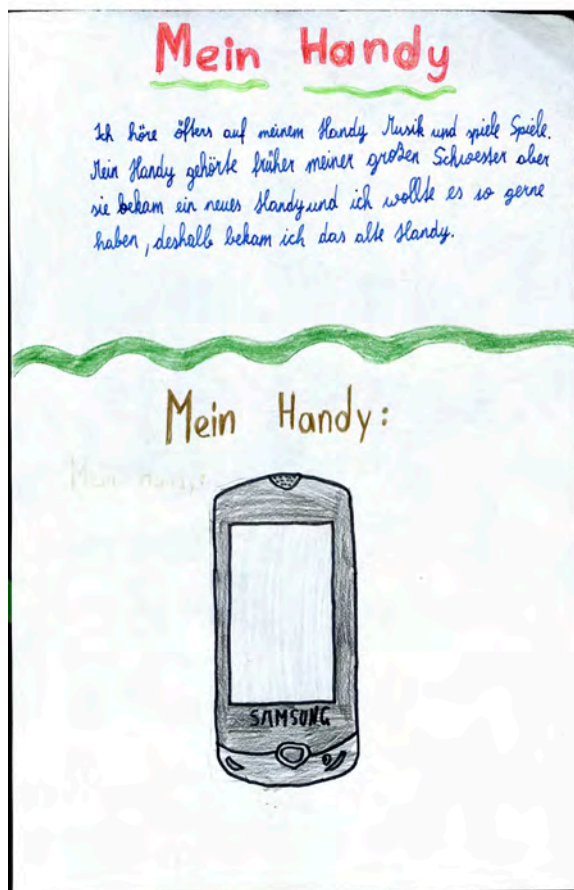
Figure 5.15.: Design Document of G1, 4B – Group 1   Figure 5.16.: Design Document of G1, 4B – Group 2
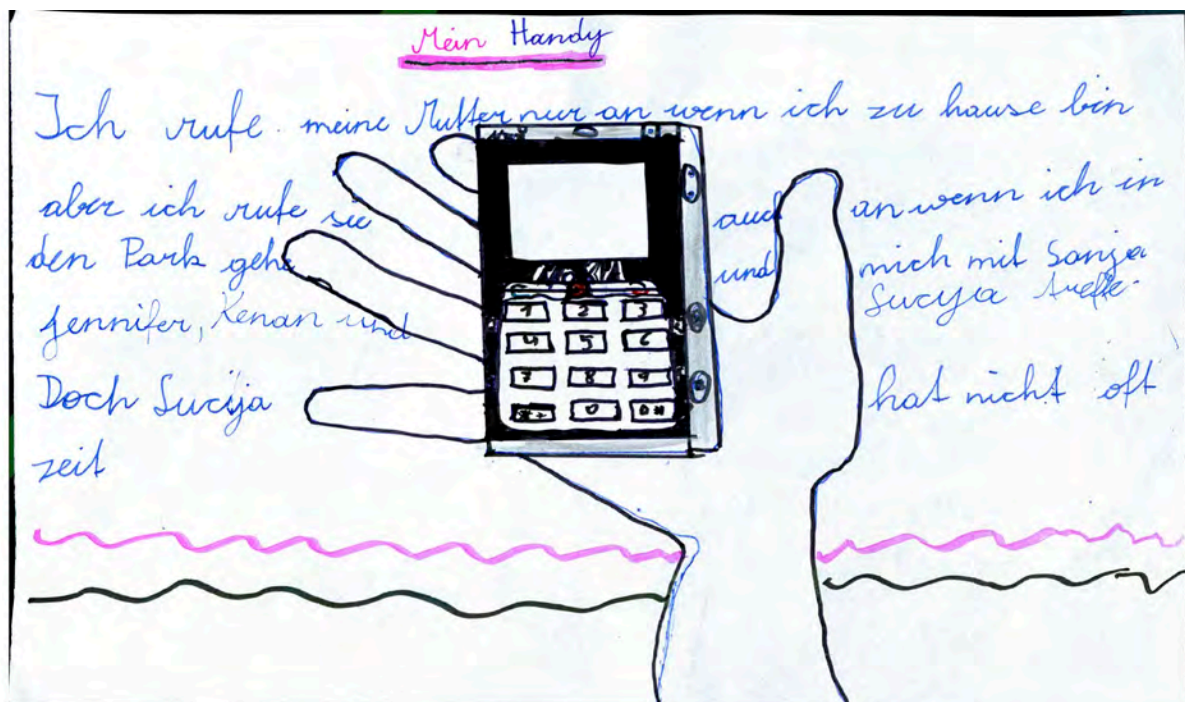

Figure 5.17.: Design Document of G2, 4B – Group 1

G2 doesn't have a smartphone, she drew her *Nokia* mobile phone in the palm of her hand and wrote her story about it:

„I'm calling my mum only when I am at home, but I also call her when I'm going to the park and meet with Sonja, Jennifer, Kenan and Lucya. But Lucy often doesn't have time. "

G1 (4B – Group2) made two LG smartphones with different displays using different applications. On the left device there is a page with the title *Facebook* and a *Facebook* logo, on the right device there is the application *„Lesen in Zukunft"* she has shown to her friends, with an internet icon (10:439). She mentioned that she uses the internet to run this application. Below her drawing where she wrote for what she uses her handy for: *Facebook*, internet and *„Lesen in Zukunft"*.

A more playful approach where story telling was used can be seen in the design document of B2 (4B – Group 1). In comparison to G1 and G2 he did not tell a story about daily occasions where he uses his smartphone. Instead he combined the functionalities of his smartphone to design a game and integrate it in a child's imagination of real life.
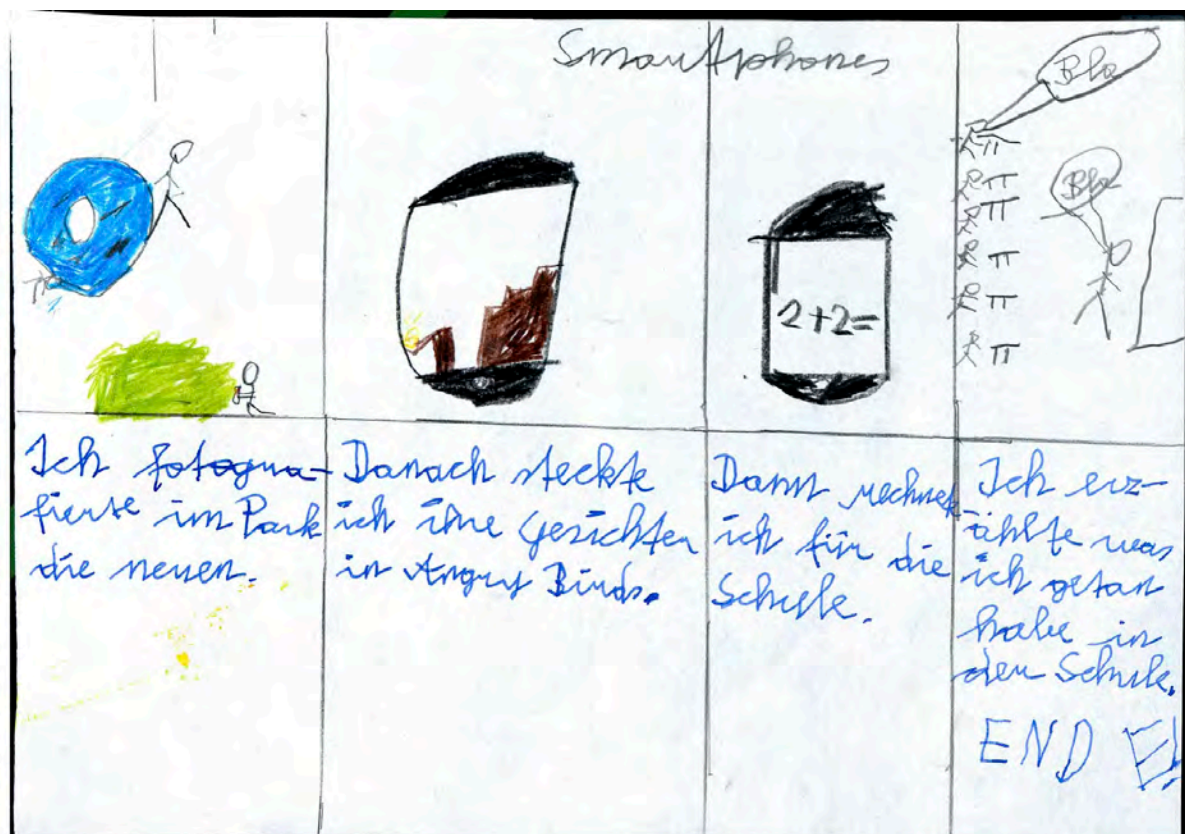
Figure 5.18.: Design Document of B2, 4B – Group1

B2 framed his stories in a story board with different activities. Once he uses his smartphone to take photos of his friends when he is in the park and puts the faces in the pictures into *Angry Birds*, later on he uses his smartphone to make calculations and explains his parents what he has done in school.

These examples show the way children use their smartphones or mobile phones outside school in their daily lives. Music, games, *Youtube* and *Facebook* are also popular among school aged children in Austria (4B – Group 2).

On the other hand children liked the idea of designing tomorrows mobile apps for schools. They appreciated it to be taken seriously. Some children invented their own smartphones and thought about what kind of application they would like to have on their devices. They already had the understanding of devices with home screens and different application widgets.

G2 and G3 (3B – Group1) were both sitting side by side and exchanged their ideas about designing an own device. They influenced each other in their visions of inventing a smarphone device which can be used in schools. Both of them drew smartphone devices with a home screen and a number of widgets of several applications. These applications can be stated as: *Leo* an english german dictionary, *Antolin* a webpage containing books for children and quizzes, *Gehweiser, Deutschapp, Matheapp, Apotheke, Musicapp.*
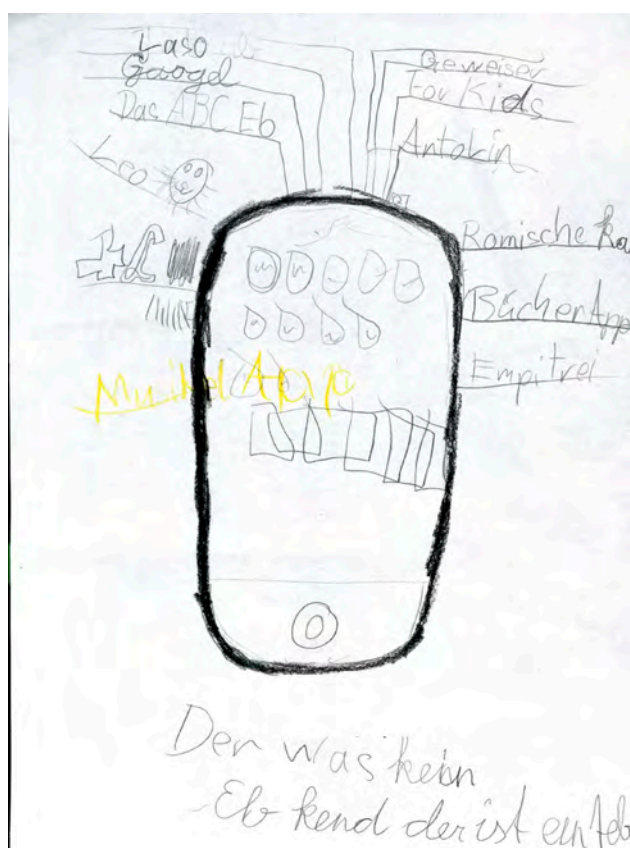

Figure 5.19.: Design Document G2, 3B – Group 1   Figure 5.20.: Design Document G3, 3B – Group1
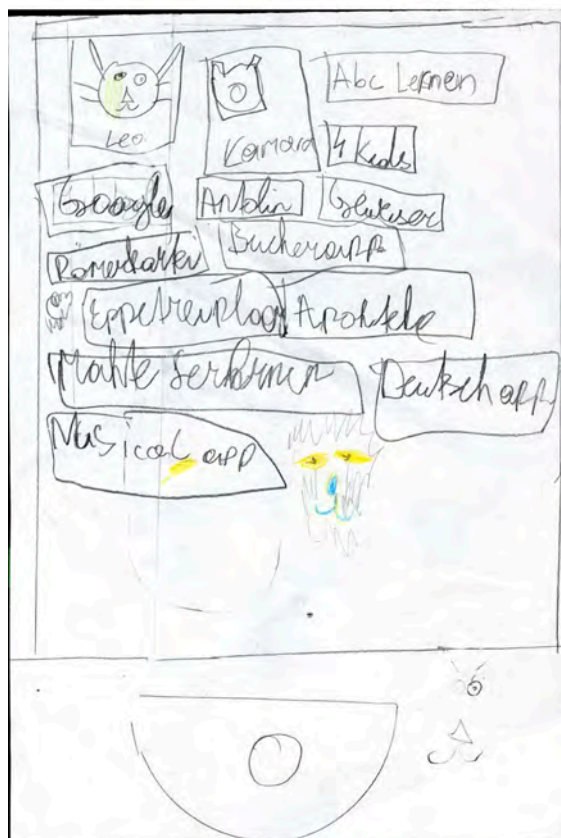
5.3.2   Mobile devices children prefered to use in their design documents

The collection of children's design sheets has revealed a number of mobile devices they have choosen to draw. According to the task of designing mobile learning apps for smartphones children could easily relate mobile applications for mobile devices. They decided to draw these mobile devices too. Their applications can be seen on the display of these devices. However other ones did not draw any devices, but they used the whole paper to show their applications. A summary of design documents where mobile devices were used will be given in the following section. Furthermore devices with whom children are familiar with in their daily lives will be suggested.

3A – Group 1 was analyzed in more detail to explain children's design sheets. The following table shows the overall distribution of devices children made use of in their documents:

Class	children	Smartphones brands	Tablets brands	Mobile phones brands
3A – Group 1	B3	Samsung Galaxy		
3A – Group 1	B2	Samsung Galaxy		
3A – Group 1	B1		Samsung Galaxy	
3A – Group 1	G4		iPad Apple	
3A – Group 1	B4		iPad Apple	

Table 5.2: 3A – Group1, distribution of devices children used in design sheets

5.3.3 3A – Group 1: Smartphones, brands (G3, 3:102) (B3)

Apple iPhone

None of the children labeled their device with the brandname *iPhone*, perhaps simply because originally the brand name is written on the backside of the device. But they used the general front cover of such a device for their *Samsung* smartphone which has a smilar front side.

Samsung Galaxy (B3, 1:12)

B1,B2,B3 have developed very similar devices, all of them designed with the brand name *Samsung*, B3 had the most developed version of the device with loudspeakers and three labeled buttons underneath the screen.

B1: He said he would make a *Samsung* tablet in his design document, although it looks more like a *Samsung* smartphone, similar to those of B2 and B3. Meanwhile he associated *iPad Apple*'s brand for tablets with tablets of other brand names, e.g. he asked at the beginning of the workshop, whether he could make an „*iPad*" and revealed his idea about making an *iPad Samsung*, which came out as a *Samsung* tablet in his design document.

B2: He agreed on the idea of developing learning applications for smartphones (1:27) and told that his *iPhone* was gone (2:54, he probably lost his *iPhone*). Nevertheless he used a smartphone design for his application, the brand name is *Samsung*.

B3: B3 came out with a *Samsung* smartphone in his design document.

5.3.4 3A – Group 1: Tablets, brands
iPad (B1, 1:7, 2:61) (G3, 1:10) (G4 design document)

G4: Has developed a tablet, an i*Pad*. On the design document you can see the front side with the display and the running application and back side with *Apple*'s label.

B4: Has made an *iPad*, a tablet of company *Apple*.

A distribution of mobile devices in other participatory design groups is given below:

Class	children	Smartphones brands	Tablets brands	Mobile phones brands
3B – Group 1	B1	No specified brand		
3B – Group 1	B2	Apple iPhone		
3B – Group 1	G2	No specified brand		
3B – Group 1	G3	No specified brand		
3B – Group 1	G5			No specified brand
3B – Group 1	B3		Apple iPad	

Table 5.3: 3B – Group1, distribution of devices children used in design sheets

Class	children	Smartphones brands	Tablets brands	Mobile phones brands
4B – Group 1	B3	Apple iPhone, Sony Ericsson Xperia		
4B – Group 1	B4	Samsung Galaxy		
4B – Group 1	G1	Samsung other		

Table 5.4: 4B – Group1, distribution of devices children used in design sheets

Class	children	Smartphones brands	Tablets brands	Mobile phones brands
4B – Group 2	B1	Sony Ericsson Xperia		
4B – Group 2	B2	Nokia		
4B – Group 2	B3	Samsung Galaxy		
4B – Group 2	B4	Nokia		
4B – Group 2	B5	Samsung		
4B – Group 2	G1	LG		
4B – Group 2	G2			Sony Ericsson
4B – Group 2	G3			Nokia

Table 5.5: 4B – Group2, distribution of devices children used in design sheets

Class	children	Smartphones brands	Tablets brands	Mobile phones brands
4B – Group 3	B1			Sony Ericsson
4B – Group 3	G1	Apple iPhone		
4B – Group 2	G2			Nokia
4B – Group 3	G3	Samsung		

Table 5.6: 4B – Group3, distribution of devices children used in design sheets

Finally an overall summary shows the amount of different mobile devices children used in their documents: smartphones and tablets are the most popular ones, a minority group drew mobile phones, these children don't have a smartphone.
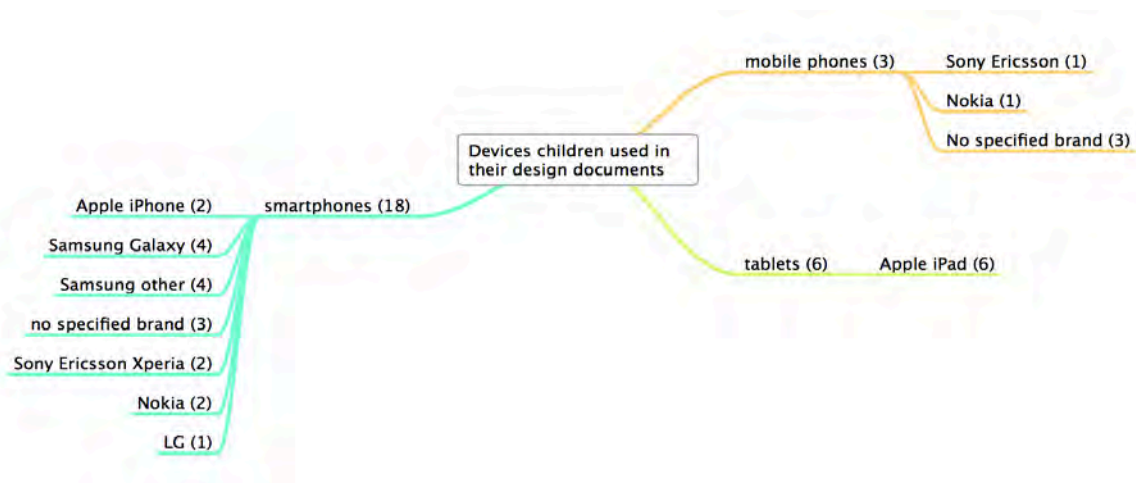

Figure 5.21.: Overall distribution of different devices used in children's design documents

Based on the devices children have choosen to draw in their design documents, we can understand the way children are in touch with these mobile devices. Hence there can be distinguished between two different kinds of occasions: Firstly children made drawings of their own smartphones and explained their general practices with these devices. Secondly children drew devices they are getting in touch through family members, e.g. B1 (4B – Group 1) made a drawing of an *iPad* with *iBooks* and told that he has used his father's *iPad* several times for reading books. Furthermore B3 (3A – Group1) told that his father had a *Samsung Galaxy*. Finally when I told the children to express their minds about mobile learning applications for smartphones, they were familiar with applications. G5 (3B - Group1) also reported that her daddy was an application developer for smartphones. All these facts indicate that children own smartphone devices or have practices with mobile devices they borrow from their relatives.
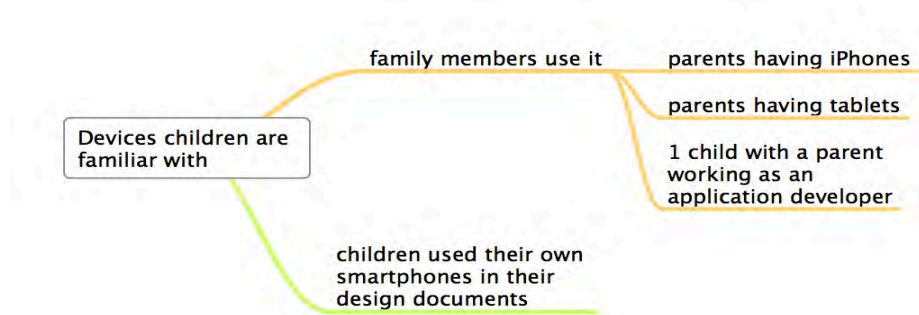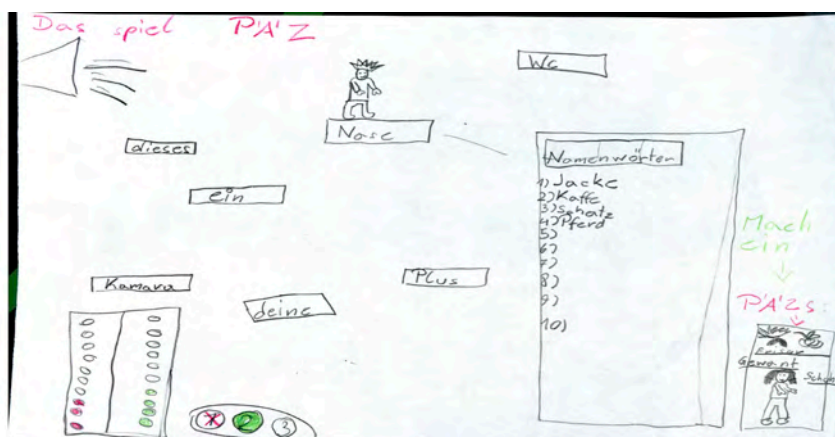

Figure 5.22.: Children's Design Documents: Devices children are familiar with

Moreover there were also design documents were no special device or brand name could be indicated. Concerning 3A – Group 1 the following outcomes have been evaluated:

The design documents of G1, G2 and G3 can be distinguished on the fact that there couldn't be recognized a device, e.g. smartphone or tablet.

G1: There does not exist an implication to derive from the design document or her comments and ideas on the design workshop, on what kind of device her learning application could be used for. Based on the presentation of the topic by the instructor and the explanation of their tasks for this workshop, it can be concluded that her learning application was designed for smartphones. In comparison to B1, B2, B3 and B4 there is not any noticeable device on her document, but three different ideas for applications, displaying an abstract screen of a smartphone which can be seen.

G2: Has developed her application like G1, the design document only contains a display and there is no special device on it. Based on her explanation about how her learning game is played, it comes to the conclusion that her learning application is used on a smartphone. (6:271)

5.23.: Design Document of G2, 3A-Group1

G3: Tablets like the *iPad* are popular for children. At the beginning of the workshop G3 said that she was making an *iPad* (1:10). As time went by she was still thinking about what kind of application she should design and asked whether she should make a smartphone. She could be influenced by her class mates B1, B2 and B3 too. At the end she thought about making an application for the *iPhone*. (4:156, 4:170). In her design document there is no device which is similar to G1 and G2.
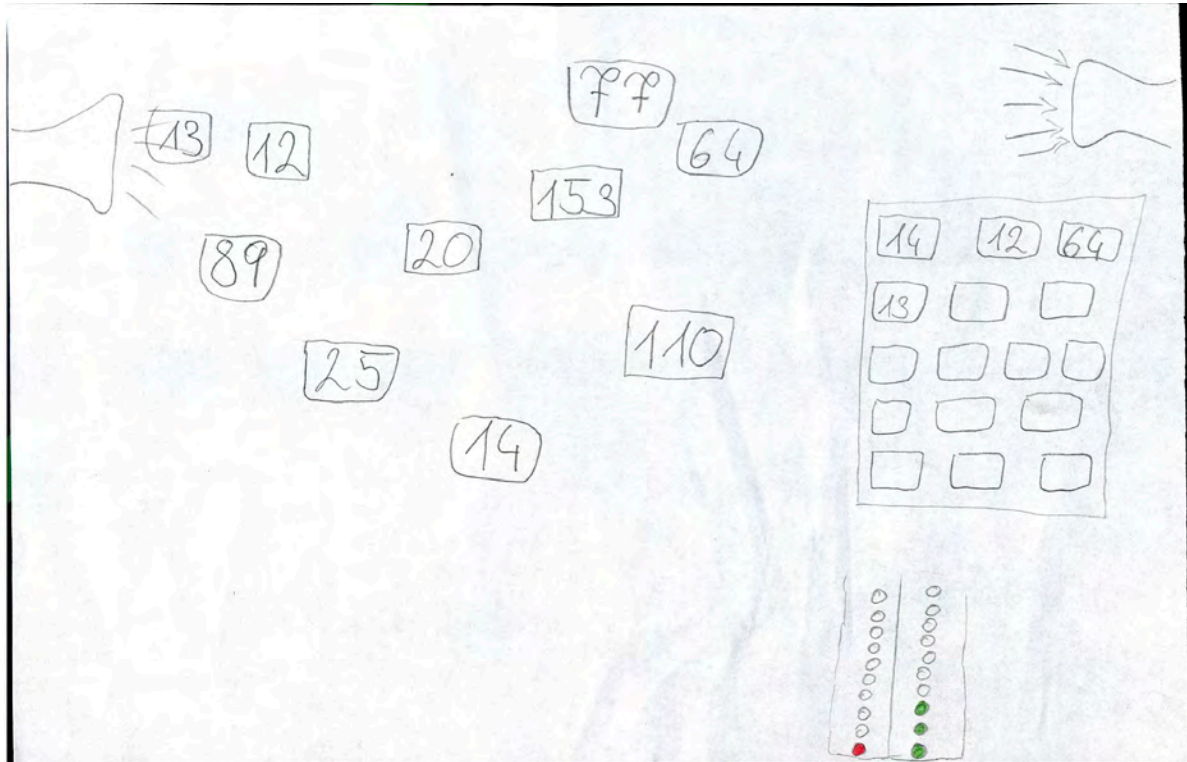
5.24.: Design Document of G3, 3A-Group1

5.3.5   Children's understanding of smartphones as devices for multipurpose use

Children's understanding of smartphones as devices for multipurpose use has been already introduced in their design approaches in chapter 5.4.1, e.g. G2 and G3 (3B – Group 1).

In comparison to other class mates, two children (G2 and G3) developed a more different understanding of smartphone devices, applications and educational applications in general. In both design documents there is a noticeable smartphone device and the home screen with various application widgets is displayed in their design study. However they have not implemented any kind of application itself like other classmates did. Both have worked with a mixed approach and combined many ideas for interesting applications. They have made a proposal for such a device they used in their real lives and thought about what kind of applications it should contain. Most of these applications were familiar to the children, hence they used these in their real lives. Like most of the children, G3 made a brainstorming on her own, her friend G2 was sitting behind her and joined this brainstorming activity. This activity can be described as both suggesting their ideas and impressions on what kind of a device or application they could draw. G3 suggested she would start to draw a handy (2:77), after a short time she came up with the essential idea in her design document, about designing this wonderful device she could imagine (3:86). At the end of the workshop G3 revealed her design document and mentioned that she has invented her own handy (11:484, 487) which could do all those different things (11:489).

Furthermore children know how to use smartphones within different kinds of activities. Some of them have practices with smartphones and tablets in their daily lives.
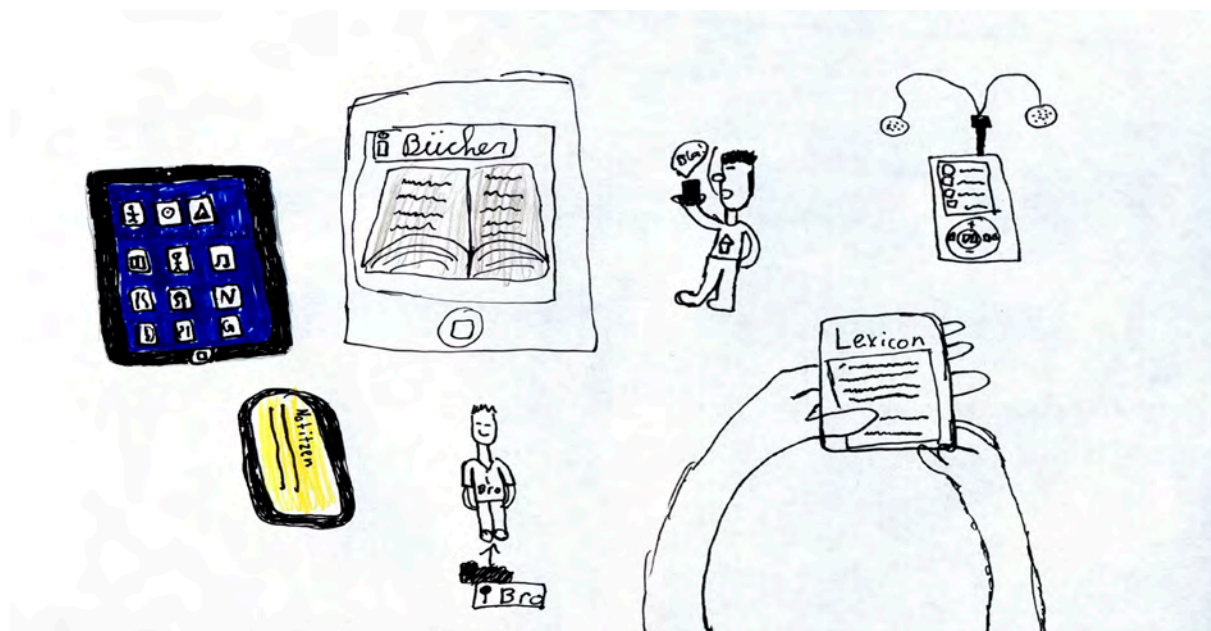

Figure 5.25.: B5, (4B – Group 1)

B5 combined several applications and experiences which smartphones offer to users. It can be seen how B5 takes advantage of his smartphone as a device for listening to music, reading e-books, taking notes or informing himself with an encyclopedia. He has made a story telling activity too, but he worked with visual artefacts. There is also the fact of a broad understanding or the smartphone as a multipurpose device where the home screen of such a device with several application widgets can be seen on his design paper.

Apart from that children make use of smartphones in their daily lives for different purposes. Firstly smartphones are used for amusement, e.g. games, music or *youtube*. Secondly to communicate with friends, e.g. phone calls, sms texting, *skype*, social media platforms. Thirdly children use their smartphones for content creation, e.g. audio, video & photos. A representation with mindmaps of children's overall smartphone activities can be found within the enclosed CD-ROM.

5.3.6   Children's Ideas on Educational Learning Applications for Schools

Children could understand what applications are. Hence they could imagine to use them in school for given learning tasks. In the following section a listing and comparison of children's several design ideas will be made.

4B – Group 1: Mathematic - calculations (B3), German – reading books (B1, B2, B3, B4, B5), Encyclopedia, Lexicon (B4, B5), Gaming (B4,B3, B2), Storytelling (G1,G2, B2, B5).

3A – Group1: Mathematic - numbers game: even numbers (B1, G3), Mathematic - calculations (B2,B3, B4), German (G2), Multipurpose games - math calculations & german reading writing (B2,B3), Multipurpose games –fun & calculations (B4), Multipurpose games- logic & math(G1), Others / games with other content(G4).
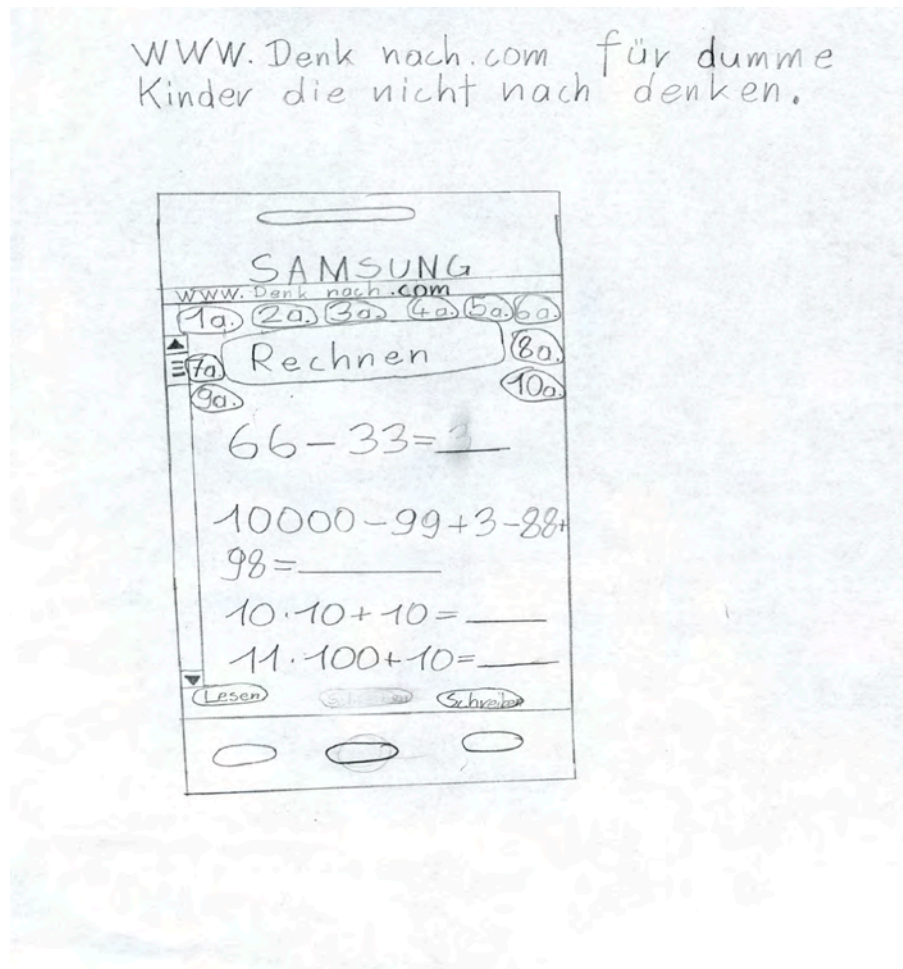
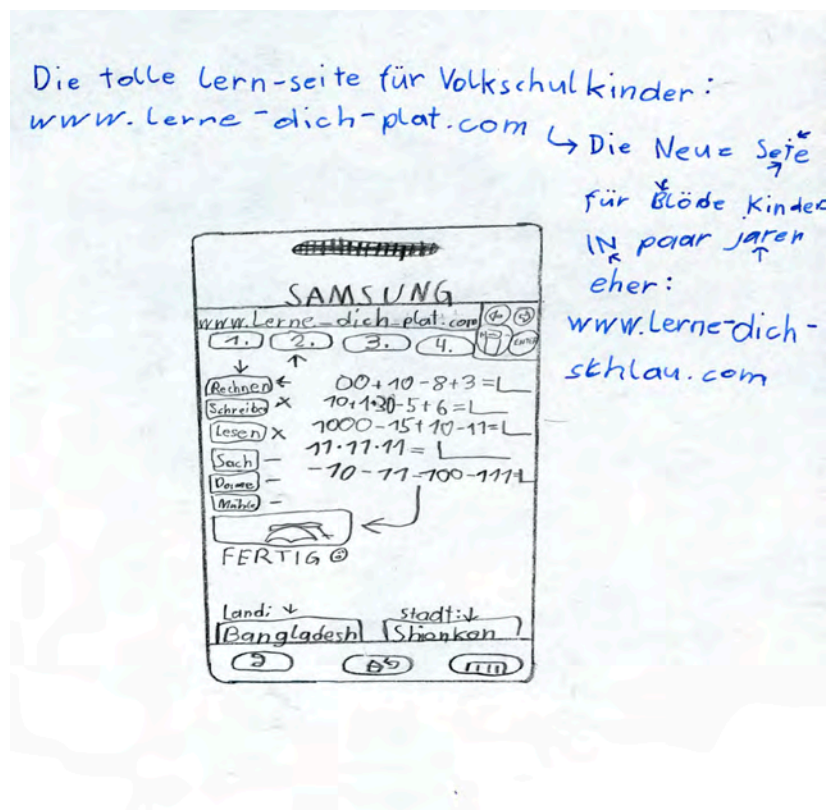Figure 5.26.: Design Document of B2, 3A – Group1

Figure 5.27.: Design Document of B3, 3A – Group1

B2 was sitting behind his friend B3, he made another version of his game. B2's educational learning game contains levels for each school grade. It is implemented for two school subjects: mathematic calculations and german reading. He has only completed mathematic calculations in his design document.

B3 had the initial idea to make this mathematic learning app for children at primary school. He works with levels, where the player has to unlock levels to use them. Each level contains a special school subject, e.g. like mathematic calculations, german writing, german reading or *Sachunterricht*. Apart from that B3 has built in a functionality where the player gets exercises for the country he is living in . He just has to choose his country and state. At the end he gets a reward, when he has successfully done all levels.

B4 has developed an adventurous game called „*Toggoclever*" where the player has to pick apples. For each apple he gets star points. At the end he has to count his stars and make a calculation, he wins with 1000 points.
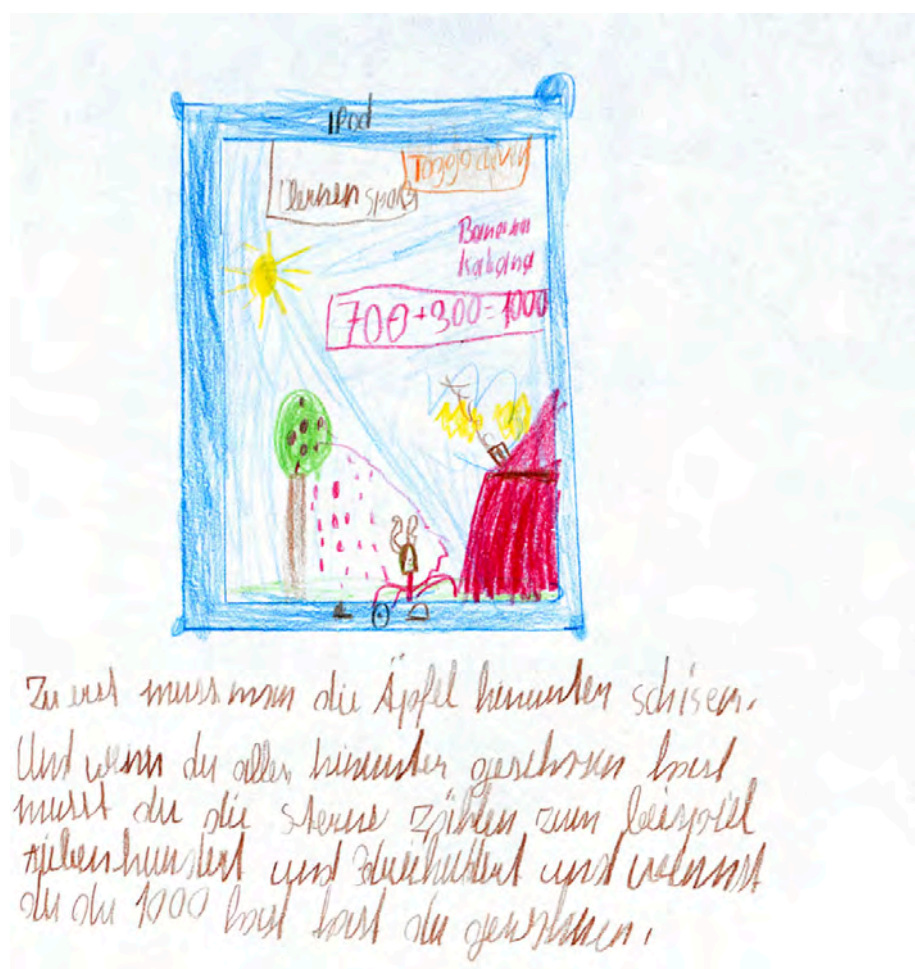
Figure 5.28.: Design Document of B4, 3A – Group1

3B – Group1: Math calculations (G1), German (B1, B2, G4), English (B3, G5, G6), Sachunterricht (B1, G7), Multipurpose games – fun & english or other languages (G5, G6), Multipurpose games – fun & german (G7 jokes), Others fun (G7 farmwille), Quizzes (B1, G6), School classes/grades (B1,G1, G4), Games with levels (G6).

Although B3 has suggested his plans about designing a german program (4:150) he finally designed an application where an english-german dictionary is implemented. He explains that he has created a dictionary for children, who want to or have to learn english (9:403). In

contrast to his class mates, B3 choose a tablet in his design document where he drew his application. He made an *iPad 1* (4:173). The screen is divided in two colums, on the left side there is always the english word displayed, the german translation is shown on the right side. After he has finished, he asked the instructor if he could cut the *iPad* on his design document, afterwards it looked like a real device (9:418). Date an time are on the display below.
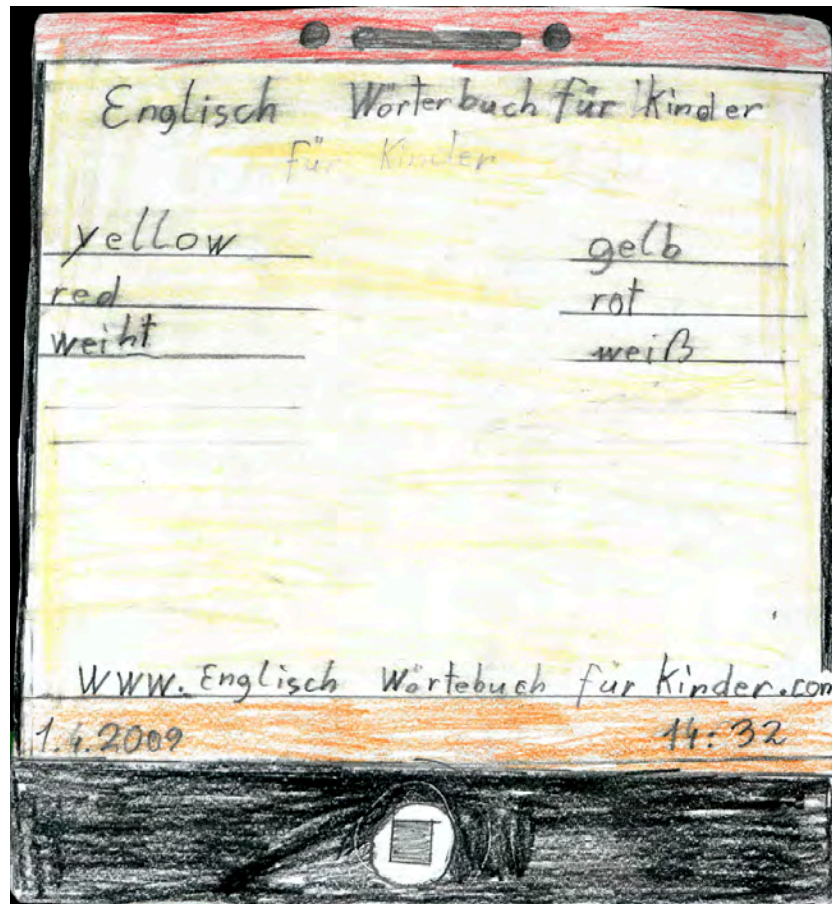
Figure 5.29.: Design Document of B3, 3B – Group 1

G6 has made a quizz game where the player gets a hint to answer a given question correctly and gains points (7:298-304). In this learning application the player has to choose an english translation of a given word. Four answers are provided to the player, these are different translations of the given word in various languages. Hence this program can help the player to learn english vocabular as well as getting to know it's translations in other languages. Furthermore G6 stated that the player has the opportunity to choose between levels, simple and heavy. In her learning game she invented a character called „*Zauberlina*" (7:311) who is guiding the player through the game. In the game „*Zauberlina*" is asking the player how a german word is called in english. Then the player gets 4 possibilities to choose an answer from (6:268), however there is a hint on the left side of the display. G6 developed a device, she explained that she has made a mobile phone. She shouted two times „my antenna" (3:132,134) and there is a coloured antenna of her mobile phone on her design sheet. After she has finished her learning application, she asked the instructor whether she should paint it (7:308) and showed her final document to the instructor and asked if it was couloured enough (10:470). She has developed a colourful device with a keyboard and an antenna. It looks like a mobile phone.

Figure 5.30.: Design Document of G6, 3B – Group1   Figure 5.31.: Design Document of G7, 3B – Group1

G7 has developed three design purposes for learning applications. There she prefered it to use three different sheets of paper. Before she started to draw she made a brain storming on herself and thought about what kind of an application she could draw, a playful game with math or something different (4:142,145). Later on she had an idea to make an application related to pets, where the player has to indicate how a displayed animal is called (4:171). This was one of her ideas which she then realised. G7 drew this application on the display of a touch screen device, a smartphone or a tablet, such a device can be recognized through it's given shape and it's boundaries. She had no special preferation concerning what kind of a device she would use in her design documents, but she listened to the instructors presentation at the beginning of the workshop, hence she knew what kind of an application she should design. The first application she drew was about animals, here the player has to type in the name of it and then continue, there she made a swap movement with her finger to show the real tangibility of the device and the application on her design document (5:227, 229). The player gets feedback and can see the amount of correct and incorrect answers he has got on the top center of the display (5:230). Once the player does not want to play anymore, he can click on the widget to get to the home screen on the left top (5: 231). This learning application can be implemented to use in schools in the course of the school subject *„Sachunterricht"*, where a special aspect would be on the environment and it's inhabitants, the animals.

5.3.7   Children's Willingness to use Smartphones in School

Derived from their design documents and the analysis of their suggestions during the design workshops we can understand how much children like the idea of using smartphones for learning in primary schools. In the following a summary of children's reactions and attitudes towards the usage of smartphones with mobile applications will be given. The opinions of third and fourth graded children of primary school St. Elisabetplatz will be explained more in detail. As as conclusion an overall position of children's expressions on mobile learning with smartphones will be discussed.

3A – Group 1:

Almost all children had positive reactions on the idea of using smartphones in school instead of computers. 5 of 8 participants (all but G1, G2 and B4) gave comments about it, some of them were astonished and excited too e.g. like „now?" (B2, 2:48), „really?" (G3, 2:45), others agreed to it respectfully and liked the idea „Alle Achtung" (B1, 2:44), „cool" (B3, 2:43), and one participant couldn't wait to get one e.g. "I want to have one" (G4, 2:49).

3B – Group 1:

B2 commented that it would cost money when people would have internet access on their smartphones (2:60). The instructor supported his opinion an responded that perhaps the state has to finance these things. G1 liked the idea of having the possibility to work with a smartphone in school, especially when they were talking about a dictionary application designed by M3 (11:500) where children could use this translator during english lessons.

4B – Group 2:

Children had different opinions on using their smartphones with learning applications in school. Some of them (B1 and G1) were hard to convince, others could imagine to use their smartphones for given possibilities (B2), other ones were strictly small minded and influenced by their teachers and given rules, with the result that they said they were not allowed to use smartphones during school lessons (G3).

Children had bad experiences with smartphones as learning devices, e.g. B1 knew he could use the calculator in his smartphone to make calculations in math but he complained of the complicated interface of this application. There it was hard to find any result, because he needed to look over a whole list of results and find the right one. Another reason was that it needed too much memory space. Moreover he had bad experiences with an english vocabulary training app formerly installed on his smartphone. However his cousin used to listen to it every day and it annoyed B1. Apart from that he was more interested in listening to music and deleted this vocabulary app to gain more free space and listen to more songs.

Because of all these reasons B1 found his smartphone not appropriate for learning and he mentioned this directly on a very sincere way when he said „*No thanks*" (5:179) or „*my handy is not for learning*" (4:149,159) (4:135,136). He said he won't use his smartphone for learning in school for sure (8:332). He repeated his opinion many times and was not interested in thinking about practices to use smartphone applications in the class room. Therefore he didn't have any ideas and suggestions how these applications should be.

G1 didn't have any ideas on how to use smartphones for learning in school too. Moreover the instructor could not gain her excitement to use smartphones during music lessons in school (9:355). This example came over, when the instructor realized that music was an interesting topic for children, children liked listening to music especially B1 and G1. Therefore she asked them whether they could imagine to use their smartphones in a music class and how this would be. B2 had more willingness in that area and said he could think about recording things in music lessons (9:362). B2 also accepted the idea of using smartphones in outdoor learning projects and taking photos on excursions. He agreed that these photos could be uploaded on *Facebook* later because it was a popular platform used. Concerning this point, B5 mentioned that they could even write on the web about their excursion (6:231). Based on these thoughts children could write reports or stories on a webpage of the school.

G3 said she could imagine to use her smartphone in the course of the art class (4:114) where she would draw with her finger on the display of her touch screen smartphone instead of using paper.

To the question of how an application for smartphones with educational content should be, the children answered that is should be big (B2, 3:98), like the *galaxy* or the *universe* (G1, 3:101).

4B – Group 3:

Although B1 had not an excat idea of how to use smartphones in school, he has made interesting suggestions on potential areas where such devices could assist children in their daily learning experience at school. He mentioned that he could imagine to experience that kind of practices with smartphones (2:26). He had a lot of great ideas but unfortunately he didn't want to write down these ideas on his design document. He said that writing was not his preferred task because he said he was lazy. He would work with an application where a loudspeaker would assist him through his learning experience.

As G1 had user experience with *iPhone* apps in her current live she could imagine to use smartphones in school too. She likes to film things with her *iPhone* cam and enjoys gathering knowledge on the web.

G1 realized a drawing of her idea to use smartphones outdoors on school excursions. On her design document she has not developed a special device, instead there is the scene of an excursion in the nature, children with their friends and teacher. Everybody holds a smartphone in their hands and they can inform themselves of how an animal is called or how old a tree would be. Ideas of this design document are similar to the *Ambient Wood* project.

Figure 5.32.: Design Document of G1, 4B – Group 3

The examples given above show us children's different positions towards the use of smartphones for learning content within the formal boundaries of a school. Firstly children are excited about the idea of having an own smartphone with mobile learning applications and would like to use it in school. However they are also aware of the fact that this could be only possible through the development of financial circumstances. Secondly a minority group of

children in this study has difficulties to associate their smartphones with learning content for school appliance. Hartnell-Young (2008) has recognized the benefit of smartphones as devices in a social context and underlined that children are already familiar with these devices from their practices in everyday life outside school. But there are still few children who don't want to use their smartphones for learning, e.g. B1 (4B – Group 2) was hard to convince. Though the majority appreciates the idea of using smartphones as assistant devices in school to review information or create and share content on fieldtrips and outdoor school excursions. Hence the widespread use of smartphones in schools can be realized through the development of mobile learning applications that fulfil the needs of a curriculum and enable children a playful learning experience as mentioned in chapter 2.2.

5.3.8 Children's design purposes for mobile learning applications divided by school subjects

As children could associate mobile learning applications for smartphones with learning content in school they had a lot of ideas of combining both aspects within playful learning games. An overall summary of children's design ideas for mobile learning applications can be classified by school subjects: mathematics, german, english, *Sachunterricht* and multipurpose usage combining learning content from two or more school subjects or learning content with gaming experiences.

A sum of the appearances of such applications in all design groups can be seen within the braces. Children's mobile learning applications can be distinguished between the following common points: *learning games with levels, games with a reward at the end, games with scales, multipurpose games combining two or more school subjects, multipurpose games combining learning content/school subjects with fun & gaming experience*.
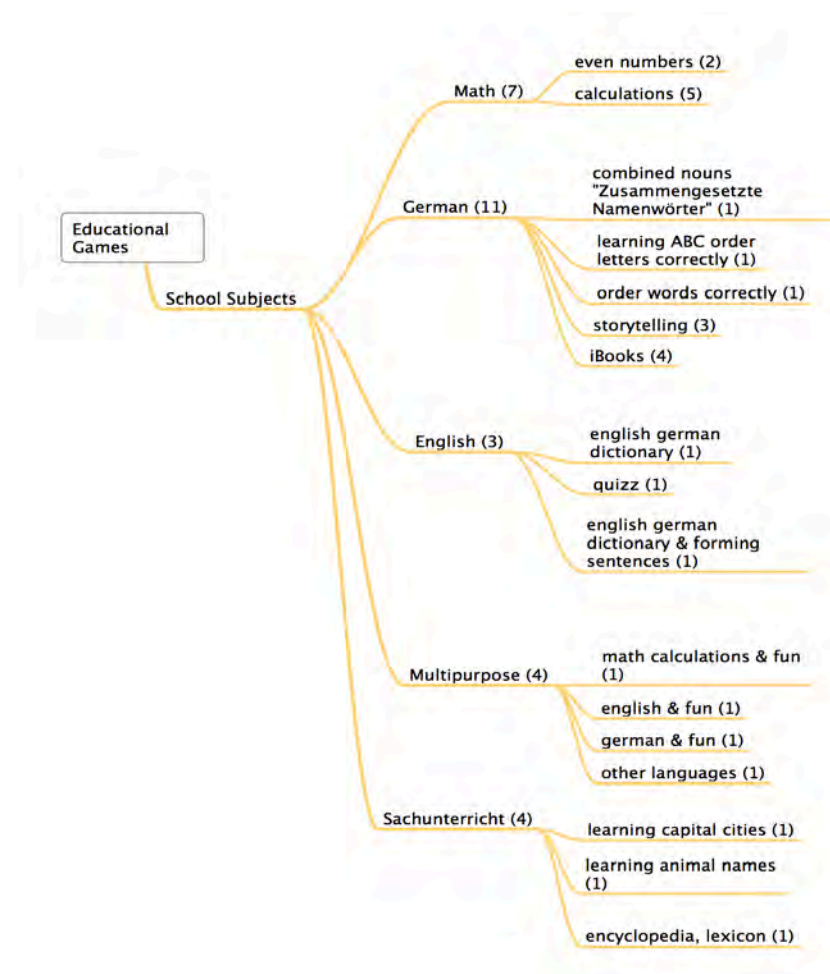

Figure 5.33.: Educational Games divided by school subjects

This chapter has shown us the way children approach the usage of mobile applications in school and introduced examples of their ideas on mobile learning applications.

6 Discussion

The topic of this master thesis *Mobile Learning with Smartphones: Integrating Handheld Devices into the everyday fabric of schools* followed a step by step progress in order to provide answers to our three established research questions. This study was primarily conducted in order to explore ideas about mobile learning applications with handheld devices in schools. Another aim of this study was to investigate teacher's requirements on pedagogically desired applications and understand their doubts and concerns on technology appliance in primary schools in Austria. Furthermore organizational conditions and regulations for a widespread usage of smartphones within schools were discussed.

For the methodological approach of this thesis an ethnographic approach with qualitative research methodologies was choosen to be the most appropriate concept of our investigations. Teachers and children's educationalists played a crucial role as adult researchers and were involved in this study for data collection. Thus qualitative interviews with teachers of primary school St. Elisabethplatz in Vienna were done in order to provide answers to our two research questions: „*What are the ways to adopt smartphones for learning context within a well defined curriculum?*" and „*What are significant points for teachers to get their acceptance for integrating mobile learning technologies in schools?*"

Teacher's experiences were used to combine mobile technologies in classrooms with learning content in order to address the lack of currently used deskbound computers in classrooms and examine possibilities to reduce these gaps. Moreover we needed to investigate in collaboration with teachers on how any mobile learning technologies were needed in their classrooms in order to enhance teacher's teaching and children's learning experiences. We defined the way mobile learning applications should be used in schools and talked about possibilities for integrating mobile learning with smartphones within a well defined curriculum. Thereby the outcomes of these two questions have been discussed in talk with teachers and children's educationalists.

Concerning my first research question, I indicated that teachers find it useful to collaborate with school book publishing in order to develop pedagogically desired mobile learning applications that are suitable within a well defined curriculum. Hence this would enable teachers to have a worthwhile and reasonable appliance of mobile learning applications in schools. Referring to this the findings of this thesis can be compared with the work of Wong et al., (2010) where a mobile learning application for contextual language learning was developed with regard to children's school books. Smartphones with mobile applications would also provide teachers a broader flexibility in the preparation and organization of working sheets and homeworks. Moreover teachers could monitor children's improvements in their learning tasks and offer them individual training tasks as mentioned in Luckin's (2008) research. A follow up activity with traditional teaching methodologies would make sense to answer children's questions efficiently. Apart from that teachers support the idea of mobile training programs appropriate for school subjects German, English and *Sachunterricht* that have a playful approach. Teachers also suggest to have training programs with levels that

encourage children to learn different tasks. Thus teachers recognized the benefits of *Incidental Learning* with mobile devices, that are motivating children for learning content and shaping their experiences in a positive way.

In the course of my second research question a special emphasis was given to understand teacher's doubts on technology appliance in schools in order to reduce their prejudices towards mobile devices. Thereby teacher's technological knowhow was recognized as an important point for defining their overall motivation to use mobile technologies at school. I found out that teachers with smartphone experiences are more likely to adopt smartphones in schools. Furthermore they have a broader spectrum of ideas for educational mobile learning applications. One of four interviewed teachers was harder to convince, because she didn't have any practices with smartphones in her own life. However all of them had a common view on defining the characteristic of mobile learning applications as training programs to improve children's skills in mathematics, german spelling or english vocabulary. Moreover teacher's would appreciate an appropriate usage of mobile learning applications outdoor on fieldtrips where children could use their devices for a number of activities, e.g. storytelling with e-diaries, narrative learning in museums or content creation and distribution on school excursions. Regarding this the following thesis can be positioned well to the work of Shih et al., (2010) and Hsiao et al., (2010) where elementary school aged children could extend their learning experiences ubiquitously with the use of mobile devices on outdoor fieldtrips. This would enable children to have an experimental approach towards learing content and enable them to collect direct experiences related to the topic of learning content.

Finally it has been recognized that teachers needed to be ensured in some points to guarantee a reasonable usage of mobile devices in schools. I figured out that teacher's are in need of specified regulations to determine the way and the amount of mobile applications used for learning content in schools. Thereby a *Mobile Learning Framework* was developed in co-work with teachers as mentioned in chapter 4.8. A summary of this framework indicates that financial feasibilities for a widespread usage of smartphones in schools are equally important as teacher's technological knowhow and their motivation to use mobile technologies in schools. Apart from that, pedagogically required mobile applications that enhance children's learning activities and support teacher's monitoring are needed to be developed. Luckin's (2008) *Homework* project provides a tool that gives teachers the authority to have control over what children are using their devices for during the school lessons. Furthermore it gives them the possibility to monitor children's workflow to see their improvements on learning activities rapidly.

Thus I have revealed that teachers accept the appliance of smartphones with learning applications in schools only for arranged times. Apart from that we need to organize where mobile devices are used and if these are the property of the school or if children own it. Furthermore a regulation is necessary to determine what kind of applications can be loaded on these devices. Concerning this issue teachers have shifting opinions on mobile devices that are used for gaming purposes only. This relates to children's activities in their leisure times and arises new questions and concerns of teachers, that primary schools should be „*technology free zones*" where basic knowledge is introduced to children and kids develop their socializing skills. Hence it is important for teachers that smartphones or other mobile „*Extra-School-Devices*" for schools don't alienate children from their environments or reduce their social interaction. Thereby teachers appreciate a useful appliance of such an Extra-School-Device in the field of organizational issues. Thus the devices could arrange communication between parents and teachers and replace children's currently used communication & information booklet. Concerning that point the work of this study can be positioned to Luckin's (2008) *Homework* project where every child in the classroom is equipped with a tablet pc and they are allowed to carry these devices at home. Furthermore

their tablets have a build in messaging functionality that supports parent and teacher communication.

In addition the amount of usage is needed to be defined within specified regulations as mentioned above. This can be accomplished in a best way through the development of pedagogically desired applications for given school lessons.

Participatory Design with children as design partners was choosen as my second methodology within qualitative reseach in order to provide an answer to my third research question: „*How can pedagogically desired applications be designed?*“. Furthermore brainstorming activities with teachers and children were done. The advantages of working with children have been taken throughout this study in the course of participatory design sessions with third and fourth graded children in small groups. Thereby I tried to benefit from children's honest views of technology with their likes and dislikes on mobile learning applications. Children's design sheets with drawings and stories on smartphones and mobile learning applications were collected carefully. Their different ideas on mobile learning applications were classified in chapter 5.4.6.

First of all I experienced it to work with children in the social fabric of a school. When the participatory design sessions were carried out, children were allowed to break the rules within the formal boundaries of a school. As there was no teacher present, I permitted the children to use their smartphones or mobile phones. I had the chance to observe them during the design workshops and see how they interacted with each other using their mobile devices. There were children taking out their smartphones from their pocket to make a drawing of their phone. Others used their devices for sharing content with their friends, e.g. one child showed his classmates videos of his cat which he has recorded on his smartphone, one child demonstrated her friend how to play an application „*Worldtimeapp*“ or „*Lesen in Zukunft*“. Furthermore children made photos of their friends making funny faces. Finally all these examples indicate how children are familiar with mobile devices in their everyday lives. This can be used as an input to think about adopting smartphones in schools for mobile learning.

On the other hand children were actors in a social context and I could observe their interactions among themselves while they were working on their design documents. Of course children had debates discussing about games and mobile devices. Others expressed their great ideas on technological improvements of the future. But most of all I recognized how children influenced each other in their design sheets when they were doing brainstorming activities together. Thereby children appreciated it to be taken as serious design partners and felt like inventors of their own mobile devices. However not all of the children had the same motivation to design their ideas. Some of them had a sense of well being, having the possibility to do something different for one school lesson. Thus they used this chance to get rid of everyday school life. Other children were highly motivated to invent their own smartphones or educational applications they could imagine to use in school. Some of them had many ideas and they asked for more paper once they have finished and wanted to make another design.

On the other hand children were helpful companions whenever other classmates founded it difficult to establish ideas on mobile learning applications.

During the design sessions I took care of wearing informal clothing to avoid it to be taken as a stranger person. Sometimes children asked me for help when they couldn't draw a horse or if they had missing ideas on mobile applications. Thus I tried to understand what kind of things they liked to do in their leisure times and suggested to combine these ideas with school subjects for mobile learning. One child had an idea to combine german jokes with vocabulary spelling, another child made an application for mathematic calculations with levels and a reward at the end.

Apart from that I found out that children's experiences with smartphones in their everyday lives play a decisive role to determine their ideas for designing applications. Children's approaches that shaped their design sheets can be derived from their personal experiences with mobile technologies. As part of this study there were children having more practices with educational applications than others. They could relate to educational learning applications immediately. Furthermore they had knowledge about the properties of educational applications as they could differ applications with a missing learning content. Thereby children connected different contexts in one application, those kind of learning applications were for multipurpose usage. Moreover children had ideas to combine learning content with fun or gaming experiences. They worked with different characteristics and included levels or a reward at the end of the game. Other ones used their smartphones mainly for gaming applications or social media apps. Based on these findings it can be concluded that last named children had difficulties to develop concepts for educational learning apps, instead they could identify themselves in their documents with gaming apps and social media. However these results should not be disregarded as they indicate what children use their mobile devices for and are classified within storytelling activities.

In addition I evaluated that children are excited about using smartphones for learning in schools. Only a minority group showed resistance to associate smartphones, that are well known devices in a social context, with learning content. However I am sure that these children could be convinced through the development of appropriate mobile learning applications with a playful approach motivating children and enabling *Incidental Learning*.

The partnership with primary school aged children provided me numerous design ideas for mobile learning applications. Children were not anxious to express their real emotions and feelings. They were openminded design partners having a wide imagination of what could be possible through technology usage in schools. But it was also a challenge for me to calm down children when they had quarrels. Besides it was a dare to gain their attention and motivate them to work on. As children talked much they sometimes loosed the context of this workshop. Thus it was my responsibility to motivate them for finishing their design sheets. When the children presented me their designs and explained what they have done I praised them and thanked for their help. At the end of all sessions I handed out chocolate bars to the children as a reward.

Completing successfully, children as child participants and teachers as adult researchers were choosen within this thesis as partners for our investigations. Hence this study could be only realized with their collaboration. When teachers's suggestions on pedagogically required mobile applications are compared with children's ideas on mobile learning applications, it can be seen that both parts work with common aspects. Firstly mobile learning applications can be classified primarily by school subjects: german, mathematics and *Sachunterricht*. Secondly all sorts of training programs are combined with a playful gaming approach and support *Digital Game Based Learning* (Prensky 2005) and *Incidental Learning* (Schank, Cleary 1995). These are applications that encourage the learner for learning content, e.g. games with levels, scales and a reward at the end. Thus the benefits of mobile applications with a playful learning approach have been recognized by teachers and the outcomes of children's design documents have revealed how children enjoy these kind of applications. Concluding the outcomes of children's design documents and teacher's suggestions on mobile learning applications could be ranged within previous research empasizing on *Incidental Learning* (Marsick, V. J., & Watkins, K. E. 2001).

7 Summary and Conclusions

In chapter 1 previous research in the field of mobile learning was critically discussed in order to identify the requirements of mobile learning in schools and address existing problems of learning with deskbound computers in classrooms, e.g. children have limited access to review information or devices are too old and work slowly. Thereby we stated that pedagogically desired mobile learning applications needed to be developed in order to adopt the use of handheld devices for learning content in schools. Furthermore we indicated teachers as key personalities who define the amount of technology appliance in classrooms. Thus we recognized the need of mobile learning applications that support children's social interaction and enable a seamless transition between different learning environments, e.g. indoor within formal school boundaries and outdoor on fieldtrips. Based on these evaluations I introduced my research questions as well as my personal interest on conducting a qualitative research in collaboration with teachers and children as design partners in the course of my thesis. Therefore the aim of my thesis was particularly to understand teacher's concerns on technology appliance in classrooms and to discuss their requirements for mobile learning in primary schools in Austria. This thesis was mainly done in order to explore ideas about pedagogically desired mobile learning applications for smartphones in primary schools.

In the course of chapter 2 the state of the art with mobile devices in our lives was introduced. Thereby existing research projects on the appliance of smartphones in everyday life as well as for educational purposes were discussed critically. Prensky's (2005) foundings on *Digital Game Based Learning* were an important approach in order to take advantage from the benefits of mobile learning with handheld devices. Basic concepts of Frohberg's (2006) existing mobile learning framework were chosen in order to have an influence on the design of mobile learning applications within the following thesis. Frohberg's (2006) recommendations on the *physical* and *digital context* of mobile learning were chosen in order to enhance ubiquitous learning experiences. Furthermore examples of mobile learning applications from previous research papers were presented in order to gather knowledge about what kind of projects have been done in the past. Apart from that, past approaches of working with children as design partners in the development of new technology were taken as decisive factors for designing mobile learning applications in the course of this thesis.

In chapter 3 an explanation of ethical and organizational issues on the implementation of qualitative research methodologies which were applied within this research study was given. General information was provided on qualitative interviews with teachers and participatory design workshops with primary school aged children of St. Elisabethplatz in Vienna, Austria.

In the chapters 4 and 5 the evaluations of the outcomes of above mentioned research methodologies were done.

Chapter 4 analysed the results of qualitative interviews with teachers and children's educationalists in order to understand their doubts on technology appliance in primary schools. It has been indicated that teachers with technological knowhow and own smartphone experiences in their everyday lives were highly motivated to use mobile learning applications

in schools. In addition they had efficient ideas on pedagogically desired mobile learning applications in schools. Hence they could determine the requirements of mobile learning in their classrooms and range their ideas and recommendations for a widespread usage of smartphones with learning content in schools & in the course of a mobile learning framework. Thereby teachers suggested to co-work with educational publishing in order to adopt the use of smartphones within a well defined curriculum and create a learner-centered classroom. Apart from that teacher's doubts on technology appliance in schools were discussed. Their fears of mobile devices were recognized and their prejudices on mobile devices that are alienating children from their physical environments and reducing social interaction were named. Thus we noticed that teachers have the opinion of primary schools as „*technology free zones*" and a „*protected workshop – Geschützte Werkstatt*" were children should learn basic knowledge. However we indicated that teachers appreciate the idea of using mobile learning devices in schools in order to enchance their teaching experiences as well as provide children numerous training applications and improve their learning. The use of mobile devices in classrooms would affect children who are working in small group projects and enable them unlimited access to information. Moreover smartphones with mobile learning applications could be applied outdoor on fieldtrips to historically interesting places and enable children to write stories in narrative learning environments or revise information right in the palms of their hands. Thus teachers notice all of these emerging possibilities and have suggestions on exactly specified regulations that determine the way mobile devices are used in schools. Hence teachers would accept mobile learning in schools only under these specifications which were also mentioned in chapter 6. Finally one teacher had an idea of developing an own device for mobile learning in schools: an *Extra-School-Device*, which can address the financing problem of mobile devices, provide equal devices with same attributes to all of the children and ensure teachers that only school and learning content can be loaded on these devices.

Chapter 5 discussed the outcomes of participatory design sessions with children and gave examples of interesting design documents. Furthermore children's social interaction with each other and the instructor was explained. Children's embodiment with smartphones and mobile phones was analysed in order to understand the way they use mobile devices in their lives. Moreover an assay of children's activities and observations were done to gather knowledge about their likes and dislikes on technology. Based on these findings their overall motivation to use smartphones for learning content in schools was discussed.

Finally the results of this thesis have revealed that future work is still needed in some areas to adopt mobile learning in primary schools of Austria. Firstly software developers should collaborate with educational publishing in order to create pedagogically desired applications and enable a worthwhile usage of mobile devices for children and teachers. Thus suitable mobile learning applications can be developed which can be used instead of CD-ROMs and address the lacks of deskbound computers. Furthermore financial circumstances for a wideranging usage of smartphones in primary schools in Austria must be ensured. Apart from that it is necassary to provide schools standardized devices with same attributes. This is an important point to overcome class differences and enable learners access to equal knowledge. Therefore we need to determine whether schools would have their own established devices, e.g. an *Extra-School-Device* where only educational applications can be loaded and which is affordable for both families and school. Moreover we must follow teacher's suggestions on a mobile learning framework that specifies *where*, *when* and *what for* mobile technologies are applied in school to reduce their anxieties and prejudices on technology. In the end further research on mobile learning with smartphones can be suggested for older children in secondary schools of Austria. Furthermore the conception of mobile learning could be also

considered for higher educational institutions where the work of Thornton, P. & Houser, C. (2005) is an example of mobile learning in universities.

8 Appendix

8.1 Table of Contents CD-ROM

1. Ethical Issues
   1.1 Information Sheet and Consent Form for Parents in German language
   1.2 Information Sheet and Consent Form for Teachers in German language
   1.3 Letter for Permission to the Vienna Municipal Education Authority

2. Qualitative Interviews
   2.1 Interview Guide - Questions in German Language
   2.2 Transcripts of Qualitative Interviews in German
         2.2.1 Interview Transcript Class Teacher – 3rd grades: 3A (T1)
         2.2.2 Interview Transcript Class Teacher – 3rd grades: 3B (T2)
         2.2.3 Interview Transcript Class Teacher – 4th grades: 4B (T3)
         2.2.4 Interview Transcript Assistant Teacher – 4th grades: 4B (T4)
   2.3 Interview Mindmaps
         2.3.1 Mindmap Class Teacher – 3rd grades: 3A (T1)
         2.3.2 Mindmap Class Teacher – 3rd grades: 3B (T2)
         2.3.3 Mindmap Class Teacher – 4th grades: 4B (T3)
         2.3.4 Mindmap Assistant Teacher – 4th grades: 4B (T4)
3. Participatory Design Workshops
   3.1 Transcripts of Participatory Design Workshops
         3.1.1 Transcript Class 3A – Group 1
         3.1.2 Transcript Class 3B – Group 1
         3.1.3 Transcript Class 4B – Group 1
         3.1.4 Transcript Class 4B – Group 2
         3.1.5 Transcript Class 4B – Group 3
   3.2 Mindmaps of Participatory Design Workshops
         3.2.1 Mindmaps Class 3A – Group 1
         3.2.2 Mindmaps Class 3B – Group 1
         3.2.3 Mindmaps Class 4B – Group 1
         3.2.4 Mindmaps Class 4B – Group 2
         3.2.5 Mindmaps Class 4B – Group 3
         3.2.6 Overall Mindmaps
   3.3 Digital Photos of Participatory Design Workshops
         3.3.1 Photos Class 3A – Group 1
         3.3.2 Photos Class 3B – Group 1
         3.3.3 Photos Class 4B – Group 1

8.2   Ethical Issues

8.2.1   Information Sheet for Teachers in German language

Wien, 19.4.2012

Informationsschreiben für LehrerInnen

Sehr geehrte Frau Dipl. Päd. T1,

Im Zuge meiner Diplomarbeit an der Technischen Universität Wien, führe ich eine Studie zum Thema „Mobiles Lernen mit Smartphones: Einbindung von Handheld Geräten in den Schulalltag" durch. Dabei würde ich gerne mit Ihnen als erfahrene Pädagogin und Kindern der dritten und vierten Schulstufen der Elisabethschule zusammenarbeiten.

Zunächst würde ich gerne mit Ihnen im gemeinsamen Gespräch, in einem Interview von ungefähr 15 Minuten, Ihre Ideen und Meinungen bezüglich der Benutzung von Mobiltelefonen und Smartphones für pädagogische Lernzwecke diskutieren. Das Interview wird als Audio aufgenommen und handschriftliche Notizen während des Interviews werden gehalten.

Weiters möchte ich Sie um die Teilnahme an einem Designworkshop mit Kindern bitten, um herauszufinden wie pädagogische Applikationen für mobile Geräte wie Smartphones entworfen werden können. Im Mittelpunkt dieser Applikationen sollen lernende Kinder und Bildung stehen. Der Designworkshop wird in kleinen Gruppen von 6-8 Teilnehmern stattfinden. Dabei werden Kinder gebeten Bilder über den Gebrauch von Mobiltelefonen und Smartphones in ihrem Leben zu malen und ihre eigenen Geschichten zu erzählen. Außerdem werden Kinder dabei beobachtet wie sie ihr Mobiltelefon herzeigen und welchen Umgang sie damit haben. Während dieses Designworkshops werden digitale Fotos erstellt um die Aktivitäten der Kinder in Gruppenarbeiten abzubilden.

Von allen Designworkshops werden Audioaufnahmen erstellt. Dies ermöglicht mir auch später nach dem Workshop die Aufnahmen anzuhören und wichtige Stellen wie Kommentare von Kindern zu notieren. Außerdem wird dadurch die Reduzierung von Informationslücken gewährleistet.

Alle Audioaufnahmen werden für die spätere Analyse in anonymer Form Wort für Wort transkribiert.

Wie mit der Schuldirektion Dipl. Päd. Brigitte Danhel am 13.Februar 2012 vereinbart wurde; wird der Designworkshop während Schulzeiten oder kurz danach in den Einrichtungen der Elisabethschule stattfinden.

Die genauen Zeiten werden gemeinsam mit KlassenlehrerInnen und BehilfslehrerInnen vereinbart. Ich würde mich freuen, wenn Sie die Einwilligungserklärungen der Kinder ihrer Klasse, die ich austeilen werde, einsammeln könnten. Ihre eigene Teilnahme am Designworkshop hängt von Ihrer Zeit ab. Wenn Sie wünschen können Sie an mehr als einem Workshop teilnehmen, andernfalls würde ich mich über Ihre Teilnahme an zumindest einem Workshop freuen. In diesem Fall werden alle restlichen Workshops mit Kindern als alleinige Teilnehmer durchgeführt. In allen Workshops werde ich mich der Gruppe vorstellen und Informationen zum Ablauf geben. Am Ende des Workshops werden Kinder ein kleines Dankeschön erhalten.

Alle Bilder die während des Workshops erstellt wurden, werden anonym gesammelt und analysiert. Alle Transkriptionen von Audioaufnahmen (Interviews und Workshops), Fotos und Bilder dienen als Referenz und werden in meiner Masterarbeit veröffentlicht. All diese Daten werden in anonymer Form analysiert, die Namen der Teilnehmer werden verändert, es werden Aliasnamen verwendet und die Identität der Teilnehmer wird nicht bekannt gegeben.

Bitte beachten Sie, dass Ihre Teilnahme oder Nichtteilnahme an dieser Studie freiwillig ist und Sie die Möglichkeit haben wann immer Sie möchten, aus der Studie auszusteigen. Bitte beachten Sie auch, dass das letztliche Ziel dieser Arbeit darin liegt, Möglichkeiten für den Entwurf von pädagogischen Lernapplikationen zu erforschen und keine spezifischen Produkte oder Applikationen entwickelt werden und es keinen kommerziellen Hintergrund gibt.

Weitere Informationen können aus dem folgenden Organisationsplan entnommen werden.

Bei etwaigen Fragen können Sie mich als auch meine Betreuung an der Technischen Universität Wien kontaktieren:

BSc. Fahrünnisa Bilgin   Univ.Prof. Geraldine Fitzpatrick, Phd.

XXXX/XXX XX XX   01/ 58801-187-35

fahrunnisabilgin@yahoo.com   geraldine.fitzpatrick@tuwien.ac.at

Ich freue mich auf unsere Zusammenarbeit und bedanke mich für Ihre Unterstützung.

Mit freundlichen Grüßen,

Fahrünnisa Bilgin

Organisationsplan – Untersuchungszeitraum

Die Teilnehmer dieser Studie sind LehrerInnen und Kinder der Elisabethschule,
St. Elisabeth-Platz 8, 1040 Wien.

TT.MM.JJJJ– Kalenderwoche__

In dieser Woche werden Informationsschreiben und Einwilligungserklärungen an Eltern und LehrerInnen ausgeteilt.

TT.MM.JJJJ– Kalenderwoche__

In dieser Woche werden alle Einwilligungserklärungen eingesammelt.

TT.MM.JJJJ– Kalenderwoche__

In dieser Woche findet die Datensammlung in den Einrichtungen der Elisabethschule statt. Dabei werden folgende Schritte durchgeführt:

4-7 Qualitative Interviews mit LehrerInnen und Pädagoden werden gehalten.

Participatory Design Sessions bestehen aus zwei Teilen, Brainstorming und Geschichten aus gemalten Bildern erzählen.

Ein Brainstorming wird mit Kindern und LehrerInnen während des Workshops in kleinen Gruppen von 6-8 Personen stattfinden .

Kinder werden während des Workshops eigene Bilder zum Thema Smartphones und Mobiltelefone in Ihrem Leben malen und später Ihr eigenes Bild erklären und Geschichten darüber erzählen. Kinder sind auch gebeten Storyboards zu malen und sich eine Geschichte auszudenken, wo sie sich vorstellen könnten Mobiltelefone zum Lernen für den Schulgebrauch und zu Hause zu verwenden. Das hierzu notwendige Material (Buntpapier, Buntstifte, Marker,..) wird von Fahrünnisa Bilgin zur Verfügung gestellt.

8.2.2 Information Sheet and Consent Form for Parents in German language

Informationsschreiben für Eltern

Sehr geehrte Erziehungsberechtigte,

Ich bin Masterstudentin an der TU Wien und führe im Zuge meiner Diplomarbeit eine Studie zum Thema "Mobiles Lernen mit Smartphones: Einbindung von Handheld Geräten in den Schulalltag" durch.

Das Ziel dieser Studie ist es in Zusammenarbeit mit Kindern und LehrerInnen Hindernisse zur Benutzung von Mobiltelefonen in Schulen zu verstehen und Ideen zu erforschen um mobile Applikationen mit pädagogischem Schwerpunkt zu entwerfen.

Dabei möchte ich gerne mit Kindern der dritten und vierten Schulstufen meiner ehemaligen Volksschule arbeiten und habe von der Schulleitung die Erlaubnis bekommen, Sie zu kontaktieren und für die Einwilligung Ihres Kindes zur Teilnahme an dieser Studie zu bitten.

Die Studie wird in den Einrichtungen der Elisabethschule stattfinden und besteht aus einem Designworkshop mit Kindern und LehrerInnen in kleinen Gruppen von 6-8 Teilnehmern. Dieser Workshop wird, wie schon mit der Schuldirektion Frau Dipl. Päd. Brigitte Danhel vereinbart wurde während Schulzeiten oder kurz danach erfolgen und eine Stunde dauern. Hierbei ist das Ziel einerseits auf Basis der Kreativität und Offenheit von Kindern und andererseits der einschlägigen Erfahrungen von LehrerInnen, Ideen für mögliche mobile Lernapplikationen für Mobiltelefone und Smartphones zu sammeln. Dabei werden Kinder Bilder zum Thema Mobiltelefon-und Smartphonebenutzung in ihrem Leben malen und Geschichten daraus zu erzählen. Die Kinder werden auch in Ihrem Umgang mit Mobiltelefonen beobachtet und sind gebeten diese herzuzeigen. Während dieses Designworkshops werden digitale Fotos erstellt um die Aktivitäten Kinder in Gruppenarbeiten abzubilden.

Studien dieser Art werden im allgemeinen als Teil eines Benutzer orientierten Designprozesses durchgeführt, um zu gewährleisten das die Bedürfnisse und Wünsche von Benutzern im Design von Technologien berücksichtigt werden.

Von allen Designworkshops werden Audioaufnahmen erstellt. Dies ermöglicht mir auch später nach dem Workshop die Aufnahmen anzuhören und wichtige Stellen wie Kommentare von Kindern zu notieren. Außerdem wird dadurch die Reduzierung von Informationslücken gewährleistet.

Alle Audioaufnahmen werden für die spätere Analyse in anonymer Form Wort für Wort transkribiert.

Alle Bilder die während des Workshops erstellt wurden, werden anonym gesammelt und analysiert. Alle Transkriptionen, Fotos und Bilder dienen als Referenz und werden in meiner Masterarbeit veröffentlicht. All diese Daten werden in anonymer Form analysiert, die Namen der Teilnehmer werden verändert, es werden Aliasnamen verwendet und die Identität der Teilnehmer wird nicht bekannt gegeben.

Bitte beachten Sie, dass die Teilnahme oder Nichtteilnahme Ihres Kindes freiwillig ist, außerhalb des formellen Lehrplanes liegt und keinerlei Einfluss auf die Benotung Ihres Kindes hat. Bitte beachten Sie auch, dass das letztliche Ziel dieser Arbeit darin liegt, Möglichkeiten für den Entwurf von pädagogischen Lernapplikationen zu erforschen und keine spezifischen Produkte oder Applikationen entwickelt werden und es keinen kommerziellen Hintergrund gibt.

Bei etwaigen Fragen können Sie mich als auch meine Betreuung an der Technischen Universität Wien kontaktieren:

BSc. Fahrünnisa Bilgin   Univ.Prof. Geraldine Fitzpatrick, Phd.

XXXX/XXX XX XX   01/ 58801-187-35

fahrunnisabilgin@yahoo.com   geraldine.fitzpatrick@tuwien.ac.at

Ich freue mich über die Teilnahme Ihres Kindes

Mit freundlichen Grüßen,

Fahrünnisa Bilgin

Participatory Design Workshop – Einverständniserklärung zur Teilnahme

Ich habe die oben angeführten Informationen Ja / Nein
gelesen und verstanden und bin mit der Teilnahme
meines Kindes an dieser Studie einverstanden.

Ich bin damit einverstanden, dass während des Ja / Nein
Workshops Audioaufnahmen von meinem Kind
erstellt werden.

Ich bin damit einverstanden, dass während des Ja / Nein
Workshops digitale Fotos von meinem Kind erstellt
werden.

Ich bin damit einverstanden, dass digitale Fotos von   Ja / Nein
meinem Kind in der Masterarbeit "Mobiles Lernen
mit Smartphones: Einbindung von Handheld
Geräten in den Schulalltag" an der Technischen
Universität Wien verwendet werden.

Ich bin damit einverstanden, dass diese Daten im   Ja / Nein
Zuge der Diplomarbeit "Mobiles Lernen mit
Smartphones: Einbinden von Handheld Geräten in
den Schulalltag" an der Technischen Universität
Wien verwendet werden.

Hiermit erkläre ich mich wie oben angeführt zur Teilnahme meines Kindes einverstanden.

Der Designworkshop wird in der Kalenderwoche __ :

DD.MM.YYYY – DD.MM.YYYY während / nach Schulzeiten stattfinden und wird eine Stunde dauern.

Name (Bitte in Blockbuchstaben): _____

Unterschrift: _____

Datum: _____

Name des Kindes (Bitte in Blockbuchstaben): _____

Unterschrift: _____

Datum: _____

8.2.3   Letter for Permission to the Vienna Municipal Education Authority
See enclosed CD-ROM.

8.3   Qualitative Interviews

8.3.1   Interview Guide - Questions in German Language

1. Was denken Sie über den Einsatz von Technologie in Schulen? Können Sie mir über ein paar Ihrer Einfahrungen mit dem Gebrauch von Technologie im Schulalltag berichten?

2. Heutzutage verwenden wir mobile Technologien in unserem alltäglichen Leben. Mit zunehmenden technologischen Entwicklungen werden neue Formen von technologiegeleitetem Lernen ermöglicht wie zum Beispiel Mobiles Lernen, E-Science im Klassenzimmer, Ubicomp, E-Learning,…
    Was das erste Beispiel betrifft, können Sie mir sagen welche Bedeutung Mobiles Lernen für Sie hat? Welche Vorteile fallen Ihnen diesbezüglich ein?

3. In Österreich hat der Staat keine gesetzlichen Richtlinien was die Benutzung von Mobiltelefons in Schulen angeht. Ist der Gebrauch von Mobiltelefons an Ihrer Schule erlaubt?

    3a) Wenn ja, warum?

    3b) Wenn nein, warum?

4. Haben Sie Bedenken oder Ängste über die Benutzung von Mobiltelefons im Klassenzimmer?

    4d) Wenn ja welche Bedenken oder Ängste haben Sie?

5. Welche Anforderungen sind notwendig um die Benutzung von Smartphones im Schullaltag zu erlauben?

6. In welcher Art und Weise kann Mobiles Lernen mit Smartphones in den Lehrplan eingebunden werden?

7. Welche Ideen haben Sie für den Einsatz von Smartphones für Lernzwecke in Ihrem Klassenzimmer?

8. Welche Eigenschaften sollten mobile Applikationen für Smartphones im bildungsspezifischen Bereich erfüllen?

9. Welche Vorteile von mobilen Applikationen für Smartphones können Sie im bildungsspezifischen Bereich sehen?

10. In welchen Situationen ist es für Sie schwierig zu unterrichten?

    (z.B.: Lärm, überfülltes Klassenzimmer, abwesende Kinder, passives Lernen und keine aktive Teilnahme am Unterrichtsgeschehen,…)
    Auf welche Art kann in diesen Situationen der Einsatz von mobiler Technologie das Lehren und Lernen im Klassenzimmer unterstützen?

11. Wie sollte der Entwurf von pädagogischen Applikationen für mobile Geräte aussehen? Welche Lücken sollten diese Geräte ansprechen, bzw. welche Lern- und Lehrbereiche können diese Geräte modifizieren und unterstützen?

    (z.B.: Lesen und Schreiben, Geschichten erzählen, e- Science innerhalb und außerhalb des Klassenzimmers, Lernen Vorort im Museum,…)

8.3.2 Transcripts of Qualitative Interviews in German

An example of Interview Transcripts is given below. A complete version of all interview transcripts can be found in the enclosed CD-ROM.

8.3.2.1 *Interview Transcript Class Teacher – 3rd grades: 3A (T1)*

Interview Date: 23.5.2012

Interview Time:08:30-09:00

Audio Filename: SAM_1798.MP4

Audio Duration: 0:20:00

Class Teacher (Schoolmaster), female, 58 years

1	F.Bilgin: Einführend habe ich ein paar Fragen über Smartphones an dieser Schule. In
2	Österreich gibt es ja..hmm keine gesetzlichen Vorgaben ah bezüglich Handybenutzung in
3	den Schulen und da kommt es ganz auf die Lehrkräfte an, ob sie das erlauben oder nicht.
4	Wie ist es in ihrer Schule?

5	Lehrerin: Naja bei uns geht's eigentlich in der Schulordnung ..verankert dass sie's in der
6	Schule nicht nehmen dürfen, also es müsste abgestellt sein in der Schultasche, was
7	natürlich im Endeffekt so ist das irgendwo was piepst..wenn jetzt Unterricht ist und das
8	dann ned abgestellt ist oder das manchmal komischerweise Eltern wenn sie wissen die
9	Kinder sitzen in der Schule am Vormittag anrufen..ja einerseits.. also früher war ich
10	konsequent da hab ich gsagt a Handy hat in der Schule nix zu suchen, mittlerweile versteh
11	ich's besser, weil die Eltern oft über die Kinder dann kommunizieren, ich geh allein nach
12	Hause, ich kann dich nicht abholen und so..und da ist das so beim Handy schon praktisch
13	na, da war ich dann auch froh bei meinem Sohn wie ich dann gwußt hab wo er ist oder so
14	was ma halt früher nicht nachvollziehn konnte. Also find ich's nicht so schlimm wenn sie
15	halt nicht Handy spielen (hebt sich die Stimme) außer es wären Lernapps (haha
16	lacht)..dann könnt ma drüber reden ja.

17	F.Bilgin: Das heißt ah in den Pausen haben sie die Handys mit dabei?

18	L: Nein, es sollte abgestellt sein von 8 bis 1, bis das Schulhaus verlassen ist sag ma steht
19	in der Schulordnung ja, nur sie nehmen's halt früher raus dann und dann sag ich ok wenn
20	sie's halt nach dem Unterricht wenn sie in die Garderobe gehn dass sie wissen dass die
21	Mama kommt vor na, zum Beispiel so dass..

22	F.Bilgin: Und bezüglich Lernapps, wie sollte man den Lehrplan gestalten, damit man ah
23	Lernapps mit Smartphones einführen kann? Weil derzeit gibt es ja ah in Ihrer Klasse gibt
24	es glaub ich Computer..

25	L:ja

26	F.:hab ich gesehn…und da teilen sich wieviele Kinder einen PC?

27	L:Also, naja ich hab Schwerpunkt Computer dass heißt ich hab deshalb 5 Computer für 20
28	Kinder und teilen kann man jetzt nicht so sagen denn wir haben das im Laufe der
29	Freiarbeit im Arbeitsplan und da arbeitet ein Kind an einem Rechenspiel einer an einem
30	Spiel am Computer, also so läuft das ab, das ist einfach in der Freiarbeit wird der
31	Computer benutzt.

32	F.Bilgin:Aha da machen nicht alle mit?

33	L:Oja schon (betont) irgendwann mach ma's alle nur nicht alle gleichzeitig also sie teilen
34	sich jetzt nicht den Computer sondern es hat jeder seinen Zugang zum Beispiel in

35	Mathematik und steigt mit seinem Zugang dann bei seinem Mathematiklevel ein spielt
36	weiter und spielt dann das nächste Mal dort, setzt dort fort und ich kann dann auch
37	kontrollieren wie weit er ist also bei diesen Programmen die ich habe ist das auch sehr gut
38	drum habe ich auch die weil da hab ich (betont) dann einen Zugang wo ich seh, wo der in
39	Mathematik steht bei dem Spiel und das Spiel bezieht sich auf's Buch, das heißt ich seh
40	genau wie weit er jetzt..ähm die Division zum Beispiel hat. Also so zu meiner Mathematik
41	oder Deutsch Computerspiele die die Kinder am Vormittag einfach machen, wenn
42	Freiarbeit ist..das ned alle gleichzeitig am Computer sind heißt's ja die einen machen
43	während dessen andere Lernspiele und so spielt sich das eigentlich gut ein. Wenn sie's
44	gewohnt sind ich mein..

45 F.Bilgin: Aha, Sie haben also eine vorgegebene Zeit für Lernspiele..

46	L: Ja genau, am Anfang wollen alle natürlich hin ein Computer ist nach wie vor sehr
47	beliebt und da streiten sie manchmal eher noch um ein Lernspiel Legespiel oder so aber es
48	spielt sich ein also es ist dann kein Problem.

49 F.Bilgin: Und wenn man das selbe mit Handys machen würde..

50 L:..ja also..

51 F.Bilgin: ..dann hätte jedes Kind ein Handy

52	L:..wenn amal jedes Kind ein Handy hätte (betont), könnt ich ma schon vorstellen, dass
53	ich das dann..gut finde hehe (lacht) obwohl als Handy sie das ja eigentlich nicht benützen
54	dürfen. Das Problem ist natürlich in meiner Klasse zum Beispiel, dass sehr wenig Kinder..
55	ah wahrscheinlich Smartphones kriegen können vom Preis her und so, also da müsstens
56	dann älter oder vielleicht ist das auch sicher in Zukunft wird das wahrscheinlich häufiger
57	sein, weil ich hab auch Eltern also ich hab nicht amal flächendeckend email Adressen von
58	allen Eltern, also manche haben gar keine, so..zum Thema Computer oder Internet.
59	Deshalb wär ichs wahrscheinlich ned einsetzen können aber ich könnt mir schon
60	vorstellen, wenn alle Kinder ein Smartphone haben (betont), weil wir haben einmal
61	angedacht dass jetzt als Einschub alle Kinder haben einmal ein Laptop es gibt da so
62	Laptopklassen und das hätt mich auch sehr interessiert, dass die Kinder am Laptop
63	arbeiten, also Texte gestalten und so..und das ist eh kostspielig und das wird
64	wahrscheinlich ist a Zukunftsmusik, zumindestens in unserem Bereich..könnt ich ma
65	vorstellen wenn das mit Smartphones abgedeckt wird bis zum Gewissen gibt ja auch da
66	zumindest bei meinem (zeigt ihr iPhone) also ich so ein wo ich schreiben kann, dass man
67	dann ja auch ausdrucken kann, da könnten's a irgenwie was..Geschichte schreiben oder
68	so, und das würden sie vielleicht, auch gern machen denk ich halt na (betont).

| 69 | F.Bilgin: Ja, und wenn Sie sich jetzt noch genauer überlegen, wie könnten solche |
| 70 | Lernapps aussehen, also welche Eigenschaften sollten diese haben.. |

71 L: Ja..da hab ich auch schon..(lacht)

| 72 | F.Bilgin:.. die man im Klassenzimmer aber auch außerhalb des Klassenzimmers für |
| 73 | Lehrausgänge zum Beispiel verwenden könnte? |

74	L: Ja da hab ich eh schon drüber nachgedacht. Hauptsächlich halt Übungsprogramme, hätt
75	ich gedacht na dass man zum Beispiel eins hat für Einmaleins Malreihen zum Üben, weil
76	die Kinder eher dazwischen dann wenn ihnen langweilig ist, dann spielen sie sonst
77	Nintendo oder so, i was net obs das jetzt derzeit tun, weil voriges mal war das bei mir in
78	der Dritten schon aktuell, aber bei denen jetzt nicht, vielleicht ist es scho wieder out ich
79	weiß nicht haha (lacht) aber da sind sie gsessen in da Pause das durften sie solangs keine
80	Probleme gab, und da sind halt alle auf ein Nintendo konzentriert gwesen und die spielen
81	ja eher wenn ihnen langweilig ist und da würd ich's halt gscheit finden wenn sie was

82	sinnvolles machen und da würden sie sicher auch ein Malreihenspiel oder Addieren
83	(betont), Subtrahieren je nachdem welche Altersstufe das ist..ja also hat sich eben auch
84	zum Verbessern der Kenntnisse bei Mathematik. Bei Deutsch ahm, weiß ich nicht wie ist
85	das mit Rechtschreib..mein es gibt ja auch zum Beispiel in meinem Handy ein
86	Rechtschreibprogramm, ob ma das irgendwie soo zamsetzen könnte dass sie
87	Rechtschreibüben, wir haben zum Beispiel Lernwörter in unserm Buch kapitelweise,
88	wenn das so aufgebaut wäre wär das halt ideal (betont)..weiß nicht..nur müsst das speziell
89	dann auf ein Lehrbuch, weiß nicht ob Sie überhaupt das auch dann weiter (lacht) oder ist
90	des jetzt nur Theorie oder ob Sie auch dran arbeiten weiter ein App wirklick zu kreieren
91	(lacht)

| 92 | F.Bilgin: Das ist jetzt grundsätzlich nur um Ideen zu sammeln wo etwas möglich wäre |

93	L: Weil man müsste mit den Verlagen zamarbeiten, weil die haben auch LernCDs zu den
94	Büchern und da könnt ma dann eventuell Lernwörter die eben auf das Buch abgestimmt
95	sind die mit die Kinder schreiben müssen, hören schreiben, weil es gibt ja eigentlich auch
96	diese Möglichkeit dass ma dann ein Ausch..ein Lautsprecher hat oder so, das ist dann eine
97	Ansage Diktat schreiben, und dass es dann halt korrigiert wird oder ein
98	Korrekturvorschlag es gibt das kann ja eigentlich ka Schwierigkeit werden, App sein..

| 99 | F.Bilgin: ..aha wenn man eine Fremdsprache lernt.. |

100	L:..auch aber ich mein jetzt auch bei Deutsch, sicher bei Fremdsprachen auf jeden Fall,
101	aber wir haben jetzt amal wenn ich jetzt ausgeh von den Grundfertigkeiten also
102	Mathematik und Deutsch…dann wär halt Rechtschreiben ein Thema das sie immer üben
103	könnten und Mathematik dass sie immer üben könnten und was ma sonst noch einfällt für
104	Sachunterricht..äh zu verschiedenen Schwerpunkten jetzt hab ma zum Beispiel Thema
105	Römer, wenns da was gäbe also ich hab da selber was programmiert fürs Internet ja..und
106	da hab ich also für zum Thema Römer weil ich das Informatiklehramt gmacht hab und da
107	hab ich eine Hausarbeit schreiben müssen und da hab ich mich aufs Thema Römer
108	konzentriert und da hab ich so ein Web gmacht für Wien, also zwei eigentlich, drei in dem
109	ganzen. Also ja für Wien und für Römer..Römisches Weltreich und ja da hätt ich jetzt
110	zum Beispiel, das is ma so eingfallen, wenn ich jetzt wieder Thema Römer hab und ich
111	bin schon soweit Zukunftsmusik, die Kinder haben Smartphones dann könnten sie zum
112	Beispiel im Smartphone so ein App bearbeiten wo man dann halt sieht..das sind jetzt nur
113	meine Ideen ja (lacht) Sie können mich ruhig unterbrechen wenn was nicht so zum Thema
114	passt..

| 115 | F.Bilgin: Nein nein das passt schon |

116	L: Wo ma halt sieht wie das Römische Reich sich erweitert hat. Da gibt's auch so Karten
117	wo ma sieht und da fängts an mit Rom und dann da hab ich irgendwie gekennzeichnet
118	welche Sehenswürdigkeiten heut noch stehen von diesen römischen Zeiten..so etwas
119	(lacht) hat mir zum Beispiel gfallen und da habs ich's dann gmacht fürs Web und so
120	ähnlich könnt ich mas vorstellen. Und das würden die Kinder sicher (betont) machen, da
121	bin ich überzeugt dass da gut ankommt…. Ja (lacht)

| 122 | F.Bilgin: Ja das glaub ich auch, dass es eine gute Idee ist |

| 123 | L: Eine gute Idee ja.. |

| 124 | F.Bilgin: vor allem um Geschichte zu lernen |

| 125 | L: ja |

| 126 | F.Bilgin: und Kultur zu lernen |

L: genau ja..und ich denk halt nachdem Handys..sind auf jeden Fall beliebt gewesen, Computer ist auch immer ein Renner und Smartphones mit Apps sicher(betont) auch wenn halt dann das finanzierbar wird in Zukunft wahrscheinlich es dann irgendwann jeder haben oder wird's goa nix mehr anders geben und praktisch is halt scho sehr, also ich schätze meines ich kann damit alles machen was ich sonst nie machen könnte na anrufen also ma hat gleich die Nummer und das is wirklich äus praktisch. Und..die Kinder muss ma immer irgendwie zum zum Arbeiten motivieren sag ma ja, und in dem Fall fallts motivieren weg weil das das Gerät macht (betont), das bringt die Motivation, der Computer bringt die Motivation das steckt im Computer drin, früher woars häut der Fernseher es is jetzt eh schon.. eher out und halt mehr am Computer wär was aktives und so stell i ma auch vor dass das am Handy dann am Smartphone einfach auch (betont) die Motivation im Smartphone steckt, die Kinder es für sich haben, wenn ihnen fad is..dann machen's was sinnvolles..aha (lacht) so bringt ma sie versteckt zum Lernen, das find i nämlich gut dabei (lacht)

F.Bilgin: Ja stimmt (lacht) Und..ah für Gruppenprozesse also Gruppenarbeiten und Diskussionen, ahm..glauben Sie das würde Gruppenarbeiten und Diskussionen anregen?

L: Sicher ja..

F.Bilgin: ..und die Kinder auch zum eigenständigen Lernen bringen..also nicht nur passiv zuhörn sondern auch dann aktiv was mitgestalten?

L: Ja ja..(nickend)

F.Bilgin:..und auch kritisieren, hinterfragen?

L: Sie meinen wenn sie jetzt, wenn wenn jetzt dann ein App gestalten oder an einem Thema arbeiten?

F.Bilgin: Wenn sie an einem Thema arbeiten mit einem App..

L: ja ja, jo sicher ..na also da da sind sie eigentlich glaub ich, egal (betont) welche Arbeitsform das ist wenn sie in Gruppen arbeiten dann..na es gibt immer a poar di halt einen arbeiten lassen aber das motiviert sie auf jeden Fall. Also wenns auch, eine andre Situation ist jetzt vor ein Buch zu sitzen oder am Tisch zu sitzen da brauchts vielleicht nicht amal ein Smartphone oder ein App aber sicher ..

F.Bilgin: Jaja da ist jetzt auch der Unterschied wenn man sich jetzt nur die Karte ansieht im Buch aha so hat sich das entwickelt aber wenn man das dann in der Hand gleich hat dann gestaltet man das mit..

L: Genau ja oder wenn man auch sieht die Kreise die's zieht oder das irgendwie plastisch oder einmal Bewegung in der Sache ist ja..

F.Bilgin: Ja ahm..zum Schluss könnten Sie mir ein paar Vorteile aufzählen die Ihnen einfallen bezüglich Smartphones mobiles Lernen im Klassenzimmer, außerhalb des Klassenzimmers. Also ein paar grundlegende Vorteile, die jetzige Lücken beseitigen können und die auch sowohl die Lehrkräfte als auch die Kinder unterstützen können?

L: Naja..ja da wüsst ich schon was aber das ist leider eine Kostenfrage, weil es müsste Internet dabei sein, also wenn ma jetzt das mit einbezieht dann auf jeden Fall, weil ma ja dann auch zum Beispiel die die Website sich vom Schulserver oder was abrufen kann wo's auch Webs oder Lernspiele und so gibt, zu denen man dann kommt oder Informationen holen, also ich hab oft..bei dem einen Computer da hab ich eben kein Internet dabei, also eigentlich hab ich nur zwei Computer mit Internet weil die anderen hängen nicht am Netz und können auch nicht ans Netz gehängt werden..und wenn ich jetzt eben zu am Thema den Kindern was einstell am Computer, wo sie zu dem Thema was

173	lesen können, Informationen, da gibt's ja verschiedene Kinderseiten wo's Informationen
174	zu allen Themen gibt, dann gibt's eben nur zwei Computer wo sie das lesen können, und
175	wenn sie jetzt ein Smartphone hätten mit Internetzugang, dann könnten sie da auch
176	Informationen rausholen das wär also schon Zukunftsmusik und würd ich sehr toll finden
177	aber an des denk i net, es ist jetzt in der nächsten Zeit wahrscheinlich..

178 F.Bilgin: Das muss alles finanziert werden..

179 L:..zu teuer sein, ja (betont). Ja aber das wird jetzt eigentlich nicht sein es gibt nur
180 Einsparungen, aber vorausgesetzt es gibt, dann stell ich ma vor dass alle Kinder Thema
181 sowieso und jeder liest nach, dann berichten's den andern und jeder hat ein anderes
182 Thema und berichtet das was er grad gelesen hat im Smartphone den andern Kindern zum
183 Beispiel..

184 F.Bilgin: Also so Arten von Referaten..

185 L:..ja genau zum Beispiel so ja

186 (4 Töne zu hören, die Schulglocke leutet)

187 L:Jetzt ein Beispiel unter vielen ja oder halt..ja wir haben zum Beispiel wo ma halt
188 Internet braucht ja eben Info hauptsächlich Informationen hm manchmal gibt's auch ein
189 Lernspiel..ja genau das wollt ich Ihnen sagen (betont), es gibt jetzt im nächsten Schuljahr
190 zum zu dem Philip und Jepe das sind vom Buchkultur Jugend so Lesezeitschriften, ahm
191 Spatzenpost oder so haben sie's auch gekannt..

192 F.Bilgin: Jaja..

193 L: Spatzenpost hat's früher gheißen a was i nimmer jetzt heißts halt Jepe ja..uund da gibt's
194 angeblich ein, da gibt's ein Internetprogramm ein Lernspiel ist immer im Internet, das zu
195 dem Thema ghört..

196 F.Bilgin: ..auf der Website?

197 L: ja…dass das Heft grad bearbeitet, die haben auch verschiedene Schwerpunkte.. also
198 Tiere, Wasser..und da gibt's ein Lernspiel dazu, das stell ich den Kindern normalerweise
199 am Computer ein und das machen sie dann, solang wir halt dieses Heft haben, weil es gibt
200 vier fünf Hefte im Jahr. Und ich hab jetzt glesen, dass der Buchclub ein App
201 programmiert, das genau dieses Lernspiel dann auch auf einem App zur Verfügung
202 steht..also das wär auch ja genau Ihr Thema na..dass die Kinder dann nicht den Computer
203 brauchen (betont), sondern eben genau das Lernspiel das für jedes Thema das halt grad
204 das Heft bearbeitet programmiert werden kann und dann auch am Smartphone spielen
205 kann ..also das solls wirklich dann im nächsten Schuljahr geben..ich hab das irgendwo ma
206 aufgehoben..ja da..

207

208 Die Lehrerin öffnet eine Schublade mit Ordnern..

209 L: Genau Buchclub und da hab ich das irgendwo glesen und doch schauschau hier beginnt
210 schon die Zukunft (betont) aja da,da..

211
212 Lehrerin zeigt mir die genannte Stelle aus dem Prospekt..

213

214 L:..ja gut iPad wär natürlich..noch amal eine Stufe besser, weils halt größer ist na
215 Smartphone hat halt schon den Nachteil weils kleiner ist..aber gut jo die Kinder sehn eh
216 noch gut (lacht) da müssen sie zwar etwas vergrößern. Aber auch das find ich genial dass

217 man so vergrößern kann (betont), also spontan halt ned eingestellt haben immer groß
218 sondern wie mans braucht ja..

219 F.Bilgin: jaja..das ist einfach..Erleben

220 L:Genau jaja..und ja zum Beispiel wenn ma das Römische Reich hat, das man so zoomen
221 kann..das wär natürlich auch dann gut. Also ich hätt schon Freude damit, wenn's schon
222 sowas gäbe (betont), aber wie gsagt so schnell glaub ich nicht dass sich's meine Eltern
223 zum Beispiel das leisten können aber ich hab einen der das hat na.

224 F.Bilgin: Ja das muss finanziert werden vom Staat natürlich..

225 L:..ja genau ja und da sind ma natürlich bei einem der großen Probleme.. (lacht)

226 F.Bilgin: Ja aber das sind Überlegungen und ich denk in Zukunft in paar Jahren

227 L:..es wird uns, es wird Einzug halten ins Schulleben, Zweifel Ohne,

228 F.Bilgin: Das ist der Standard heute..

229 L: Jaja, sicher ja und man kann ohne das goa nimma sein wenn man's mal kennen gelernt
230 hat..

231 F.Bilgin:..und das is ja ganz gut weil dann können die Kinder dann auch zu Hause aber
232 auch in der Schule damit..

233 L:Ja, ja genau jaja eh und i mein so auf der Basis stell ich mas auch vor mit Schulverlagen
234 dass es zu den Büchern was gibt..

235 F.Bilgin: mit Schulverlagen zusammenarbeiten jaja…

236 L: und halt ja man kann natürlich alles nehmen, man kann auch eins im Kopf
237 programmieren irgendwie in einem Thema aber halt im Zusammenhang macht's natürlich
238 mehr Sinn würd ich sagen..

239 F.Bilgin: Ja man könnt speziell mit der Schule zusammenarbeiten, aber nachdem Sie diese
240 Bücher verwenden glaub ich ist es am besten wenn man mit den Schulverlagen..

241 L: jaja weil das wär vielleicht auch einfacher, wenn der sowieso CDs und LernCDs
242 programmiert irgendwie, also wie's programmiert wird weiß ich nicht (lacht) Wie ein App
243 programmiert wird, ich kann also grad halt ein Web aber..

244 F.Bilgin: Haben Sie Ängste bezüglich der Benutzung von Smartphones und Technologie
245 im Klassenzimmer?

246 L: Nein nein ganz im Gegenteil ich würd mich freuen wenns meine Kinder hätten, nur ich
247 weiß es ist momentan nicht realistisch aber ich wüsste nicht welche Ängste ich haben soll.
248 Weil es ist auch so dass die Ängste dass die Kinder auf Seiten surfen und so die hab ich
249 auch nie (betont), weil ich stell das ein und was anderes macht..mein zu Haus kann ich
250 natürlich ned sagen was sie tun na, aber ich stell den Kindern ein was zum Thema passt
251 und was anders machen sie nicht (betont) also ich versteh diese Hysterie eigentlich nie,
252 weil allein surfen sie..mein weiß goa ned manche können das wahrscheinlich nich, sie
253 können eh nur bedienen was sie glernt haben von mir, aber das würd ja sehn wenn da jetzt
254 irgendwelche Seiten abrufen

255 F.Bilgin: Aber Sie sind ja eine sehr erfahrene Lehrerin, manch andere Lehrkräfte haben
256 nicht so viel Erfahrung mit diesen Technologien, deshalb glaub ich gibt's da auch..

257 L: Genau..ich glaub das ist eh ..weil man halt dann nicht weiß wie man sich. Das war
258 eigentlich der Grund warum ich das Lehramt gmacht hab (betont), weil ich ma gdacht hab

259 is Zukunftsmusik und i kenn mi ned aus die Kinder kennen sich dann besser aus und das
260 will ich nicht hehe (lacht) Drum hab ich das gmacht.

261 F.Bilgin: Ja da haben Sie sich klug entschieden (lacht)

262 L: Ja, und wenn ma sich eben auskennt dann verliert ma die Ängste, sonst weiß ma ned
263 was tun die Kinder und ich kann da nix ändern oder steh dann da ne, des kann ma ned
264 passieren weil ich hehe (lacht) ich's im Griff hab und aus dem Grund hab ich's auch
265 gmacht

266 F.Bilgin: Natürlich, dann sind Sie auch offen für neue Entwicklungen und..

267 L: ja..und hol mirs auch selber hehe (lacht)

268 F.Bilgin: Super, das ist toll. Ahm..ja wir haben eigentlich schon über alles gesprochen,
269 was ich mir aufgeschriebn hab, ich bin jetzt ned alles ganz strikt Wort für Wort
270 durchgegangen aber wir haben alles. Und bei bei mobilen Apps gibt es dann eben andere
271 Design Metaphern die man verwenden muss, eben weil man jetzt ned für ein PC
272 entwickelt, sondern doch ein Smartphone welches man in der Hand hält und das dann
273 überall mit sich herumträgt..

274 L: Jaja..

275 F.Bilgin:..und bei Computern ist es ja so dass die Kinder dann nur auf den Bildschirm
276 eingeschränkt sind, das sind die meisten Vorurteile von Menschen, das sie dann nicht mit
277 den andern Kindern kommunizieren..

278 L:..Jaja..

279 F.Bilgin: ..und jetzt müsste man eben für Smartphones oder für Tablets dann andere ahm
280 Design Metaphern verwenden, weil man das eben bewusst herumträgt und bewusst mit
281 der Umwelt interagieren soll

282 L: ok. Naja in welcher Form, i weiß jetzt ned ob ichs ganz verstanden hab..

283 F.Bilgin: Also welche Kriterien jetzt für die Smartphoneentwicklung wichtig sind,
284 natürlich erst mal dass mans herum tragen kann und zweitens eben zum Beispiel für
285 Lehrausgänge, dass man auch dafür Apps entwickelt, dass die Kinder auch draußen
286 Informationen sammeln können denk ich mir im Museum oder..hatte schon gestern diese
287 Idee von einem Kind

288 L: Ja..Na i würd nur dazu sagen weil man sagt die sitzen vor dem PC und kommunizieren
289 nicht dann mit keinem Menschen, ah.. sie tun's ja dann, also man kanns jetzt nicht so
290 schlimm sehn, sie tun's ja trotzdem auch wenn ma sagt tu's nicht, wenn sie's gern machen
291 dann sitz sie halt dann da ne, und wenn sie rausgehn, sicher solln sie auch Bewegung
292 machen oder so aber wenn sie zum Beispiel ein mobiles Gerät haben sitzns halt dann dort
293 wieder und schaun nur auf das, also da würd ich jetzt kein Unterschied sehn. Also i mein
294 obs jetzt das Gerät mobil ist (lacht) die Kinder sind dann trotzdem, wenn sie draußen sind
295 dann sollen sie halt einfach Fußball spielen oder so, und wenns dann mit dem mobilen
296 herumgehn und auch wieder nur auf den Bildschirm schaun würd ich keinen Unterschied
297 sehn ob sie jetzt vorm PC sitzen oder so..das wär jetzt eigentlich egal, ich denk nur wenn
298 sie..mit andern wie sie eher kommunizieren mit andern meinen Sie? Welche Apps sie
299 zum kommunizieren anregen?

300 F.Bilgin: Ja, zum Beispiel.

301 L: Ja na gibt's nicht auch so irgendwie (lacht) Verbindungen so wie Mail oder so Rede –
302 Antwort, also Chat wo man halt so irgendwie ned das in der Form sich über zu einem
303 Thema unterhalten müssten

304	(4 Töne zu hören, die Schulglocke läutet)
305	L: So was hamma auch amal am Computer ghabt so ein Thema..genau da gab's zwei
306	Adressen und zwei Schulen und die dann miteinander über den Computer zu dem Thema
307	gredet haben. Also so vielleicht, ja.
308	F.Bilgin: Ok, vielen Dank dass Sie sich Zeit genommen haben.
309	L: Ja gerne.
310	

(Seite:Zeilennummer)

Einsatz von Smartphones im Schullehrplan (1:22,23)

Geschichten schreiben und ausdrucken (2:66,67)

Übungsprogramme (2:74)

    Einmaleins Malreihen zum Üben (2:75)

    Malreihenspiel oder Addieren / Subtrahieren (2:82,83)

    Altersstufe (2:83)

    Kenntnisse der Mathematik verbessern (2:84)

    Deutsch Rechtschreibprogramm (2:84,86)

    Rechtschreibüben (2:87)

        Lernwörter kapitellweise im Buch (2:87)

        „Speziell auf ein Lehrbuch" (2:89)

    Grundfertigkeiten (3:101)

        Mathematik (3:102)

            Mathematik dass sie immer üben könnten (3:103)

        Deutsch (3:102)

            Rechtschreiben ein Thema das sie immer üben könnten (3:102)

    Sachunterricht (3:104)

        Verschiedene Schwerpunkte (3:104)

            Römer, Römisches Weltreich (3:105, 109)

            „Am Smartphone eine App bearbeiten, (3:112)

            sehen wie das Römische Reich sich erweitert " (3:116)

            welche Sehenswürdigkeiten heut noch stehen (3:118)

            plastisch (4:160)

            Bewegung in der Sache (4:161)

Zusammenarbeit mit Schulbuchverlagen (3:93)

    „Spiel bezieht sich auf's Buch" (1:39)

    Lernwörter die auf das Lehrbuch abgestimmt sind (3:94)

        Rechtschreibüben (2:87; 3:102)

Ansage Diktat mit Korrekturvorschlag (3:97,98)

Lautsprecherfunktion des Smartphones (3:96)

„Zukunftsmusik" (2:64; 3:111, 4:177; 6:261)

BELIEBT (3:127)

Computer nach wie vor sehr beliebt (2:46,47)

Computer ein Renner (3:128)

Handys, auf jeden Fall beliebt gewesen(3:127)

Smartphones mit Apps sicher (3:128)

Wenn das finanzierbar wird in Zukunft (3:129)

Motivation (3:134)

Kinder müssen zum Arbeiten motiviert werden(3:132,133)

Motivieren fällt weg(3:134)

Gerät bringt Motivation (3:134)

Motivation im Smartphone (3:138)

„Kinder versteckt zum Lernen bringen" (4:139)
sinnvolle Arbeit wenn langweilig (4:139)

8.3.3 Interview Mindmaps Teachers

Examples of mindmaps generated from teacher's interview transcripts is provided below. A full version of mindmaps can be found in the enclosed CD-ROM.

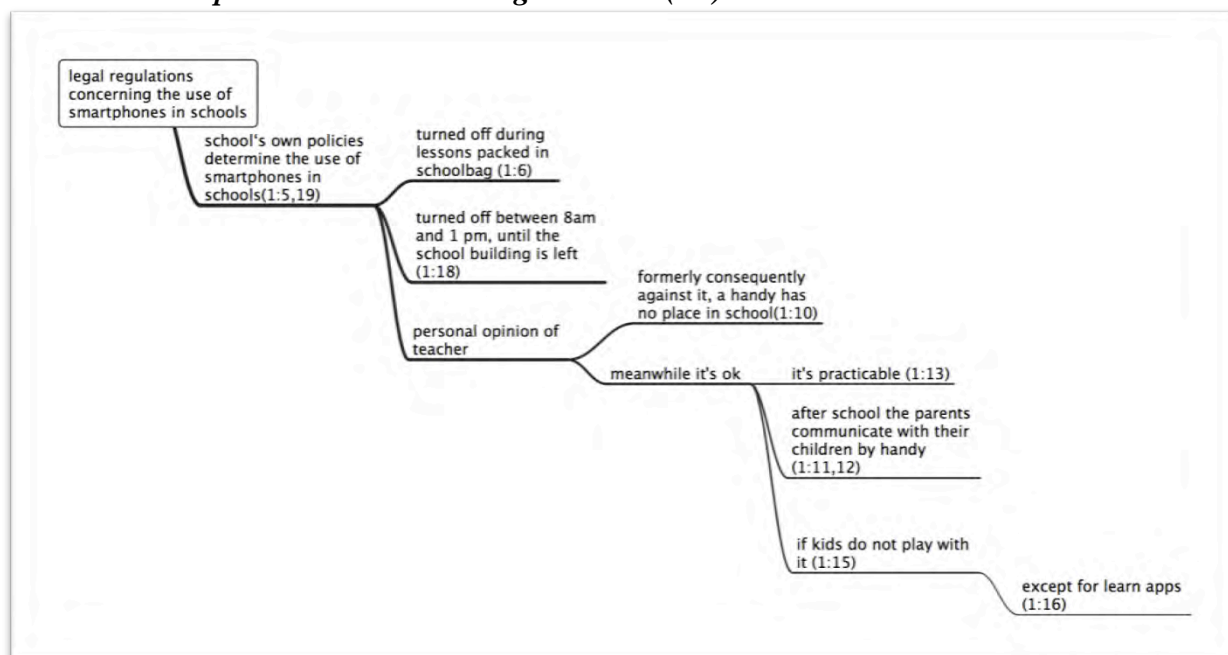### 8.3.3.1 Mindmaps Class Teacher – 3rd grades: 3A (T1)

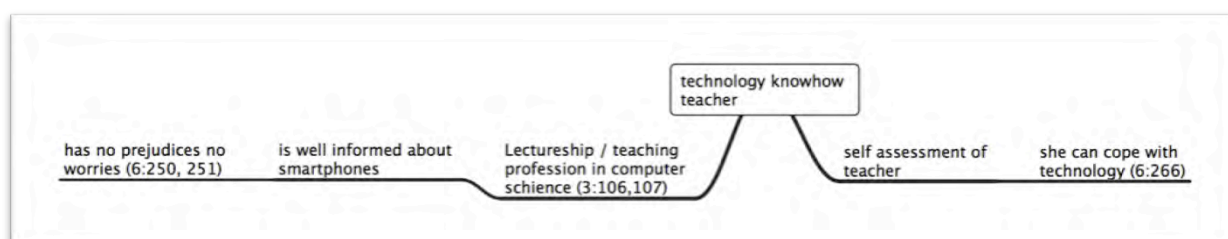Figure 8.1.: Legal Regulations determining the use of mobile devices in schools
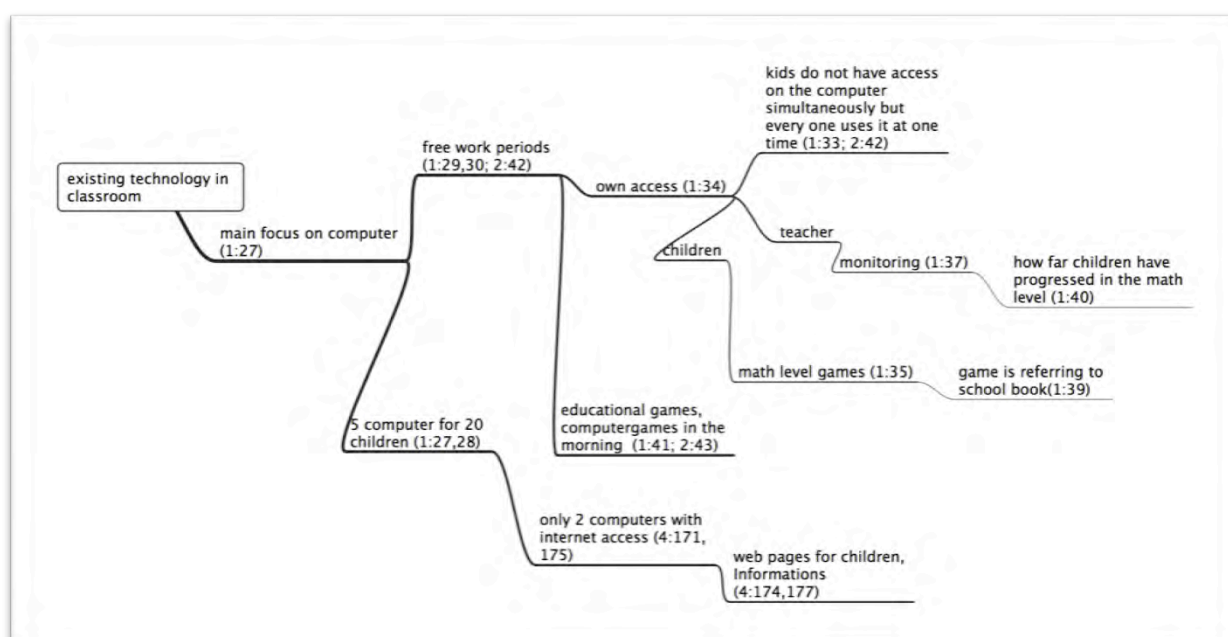

Figure 8.2.: Teacher's technological knowhow

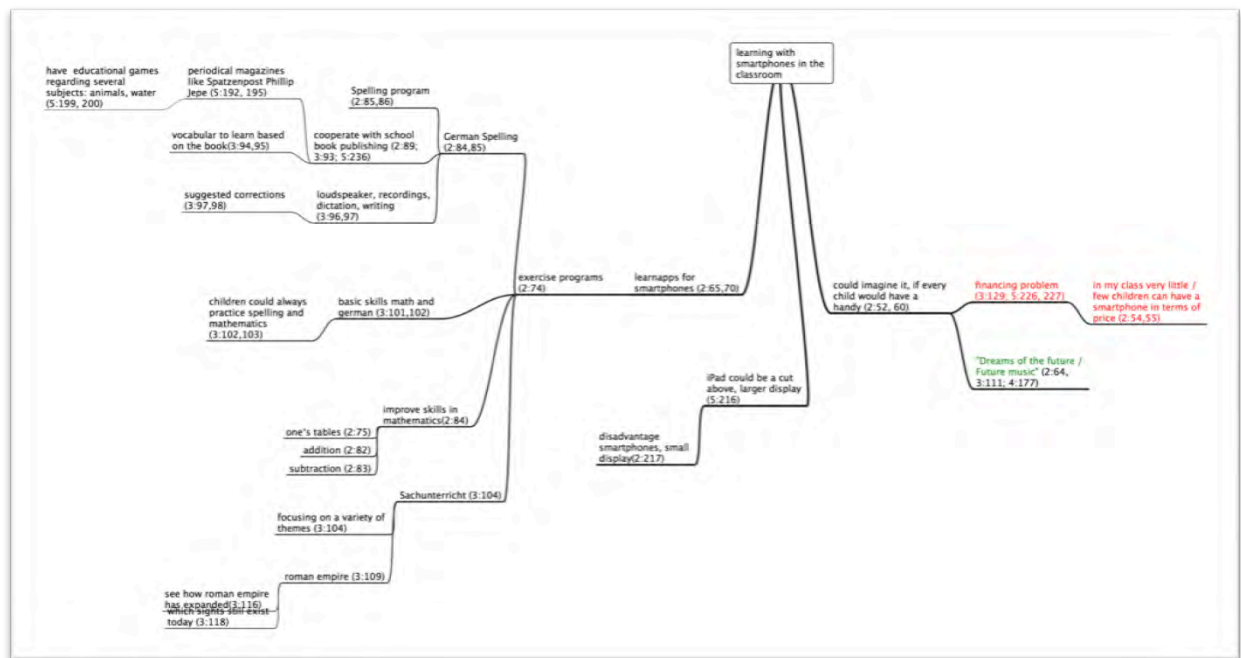
Figure 8.3.: Teacher's technology appliance in classroom
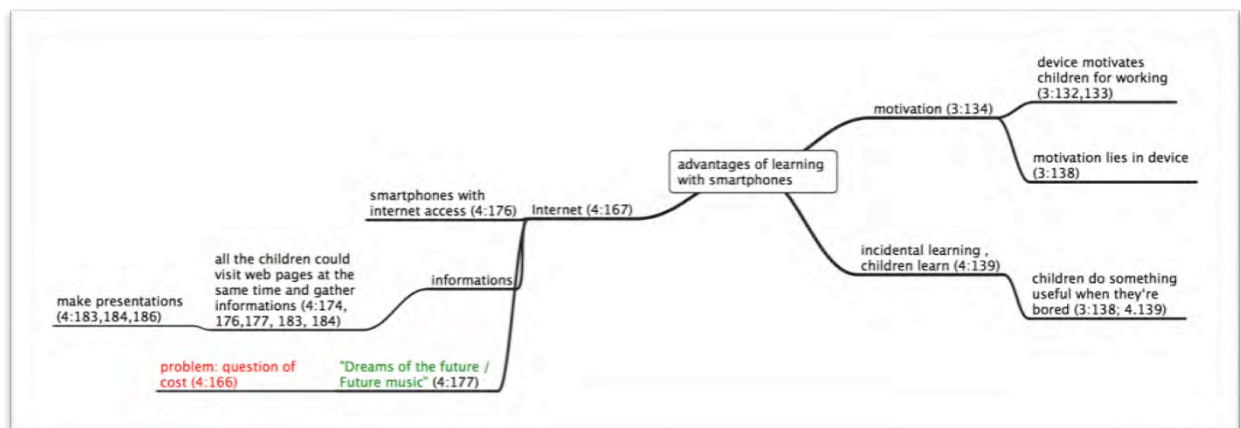
Figure: 8.4.: Teacher's ideas on mobile learning with smartphones in schools

8.5.: Teacher's thoughts on the advantages of mobile learning with smartphoes in schools
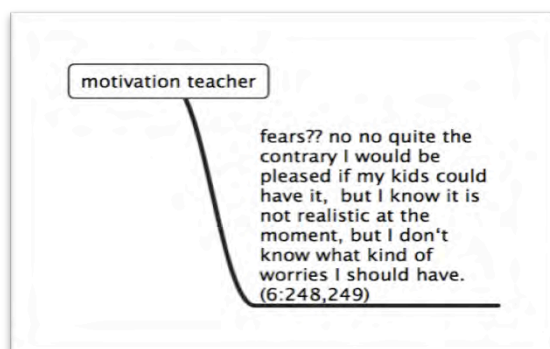

Figure 8.6.: Teacher's overall motivation to use smartphones for learning in their classroom

8.4 Participatory Design Workshops

8.4.1 Transcripts of Participatory Design Workshops
See enclosed CD-ROM.

8.4.2 Mindmaps of Participatory Design Workshops
See enclosed CD-ROM.

8.4.3 Overall Mindmaps of Participatory Design Workshops
See enclosed CD-ROM.

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