

# MOOP - USING M-LEARNING ENVIRONMENT IN PRIMARY SCHOOLS

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## Abstract:

Moop is an interactive m-learning environment for situations where primary school pupils take use of a mobile phone to analyze their surroundings and to communicate within groups. Through Moop, a pupil makes observations and saves and manages information in the mobile and network learning platform. The learning environment supports the process of inquiry learning, during which a pupil outlines his or her thoughts on the current topic, collects information and observations from the surroundings and reports the findings in the network-learning environment. Moop project is based on needs of schools and teachers: the traditional learning environment is broadened from classroom to observation in the surroundings. The goal is to increase interactivity and collaboration in learning with the help of a mobile phone. In the Moop environment the mobile learning is realized through tasks based on geographical location and requiring creative problem solving. Camera phone is familiar for pupils and a meaningful tool for communicating and working. The benefit of a mobile data terminal is that it goes where the learners go. Experiences with this tool have showed that inquiry learning processes can happen as part of daily school work and the tool was easy to use with students aged 10-12 years.

Moop application interface has been designed for Symbian (S60) platform technology. The application collects the media from the phones and shares it through real-time data-connection to server and www-environment. The connection used in the process is data-connection (GPRS/3G). Locating is based on GPS-technology which enables connecting observation and orientation tasks. Pupils (and teacher) communicate using push and talk (PoC) application.

Keywords: *m-learning environment, primary schools, inquiry learning, creative problem solving*

## 1. Introduction

The aim of this paper is to introduce the Moop m-learning environment and show its benefits to the primary school learning. Young people use mobile phones, SMS and other mobile services undoubtedly and without prejudice. During Moop-project has been created contents that improve the teaching opportunities and genuinely motivate the pupils. Moop is a "real" practical application for primary school use. The demand for such environment came from teacher's need to expand the traditional classroom environment to the examination of the surrounding phenomenon and problems.

The basic ideas at the background of Moop are: school curriculum and content of education, pupils as users of technology, collaboration with parents and school, cooperation between the schools, breaking the boundaries between the classrooms and developing the pedagogy. The main purpose for the school is to provide basic education and it is important to maintain it. ICT-technologies support the pupils learning process. Mobile learning environment has to adapt as a natural part of the daily schoolwork and pupils class schedule – as a part of the knowledge building model.

The purpose of this project is to create a learning platform for mobile learning situations where a pupil works in a mobile and network environment. Mobile phone is used to bring observations from nearby surroundings to the classrooms and to school teaching situations where they are handled co-operatively. Information from neighbourhood will be utilized in learning process. One goal is to create a user interface, through which a pupil is able to outline his thoughts, observations and share them with other pupils. The intention is to use the environment both at school and in leisure time. Then the application will be seen rather as a possibility, not as a necessity for study. Learning through observation occurs in real life.

This paper expresses in practise the pedagogical principles from the learning impression and from the teacher's work. The actions and qualities of the environment and the accomplished education are also described – ending up considering the direction of the continuation development.

## 2. Pedagogy

The pedagogical principles are: inquiry learning, skills for gathering information and building knowledge, creative problem solving and leading to the interactive and cooperative learning.

Information and communications technology must support the learning. Mobile learning environment supports the ICT-teaching entity by offering a wireless and transportable solution to support the pupil's thinking and actions. The bare equipment won't just do the learning – ultimately the learning still takes place in learner's own head.

School actions must be based on rational contents from the school's curriculum. The equipment or teaching method being used depends on its benefit to the learning. Teaching is aimed at developing the learner-centric classroom techniques, when the learning is seen as a process. Learning process is based on a familiar and meaningful approach, which will be used when solving the problem. In our teaching practise we use the model of knowledge building. We call it also as model for "rational actions" in a classroom. It is based on experiences noticed in a school practise.

This knowledge building model has been developed as a pedagogical guideline for working at school. Model is originated from the teacher's need to understand the entity of the teaching situation. The learning process is based on a simulation of learning situations. This model is meant for both primary school pupils' and teachers' use. With this model they know in what phase of the task solving process they are and what actions still need to be done in order to achieve the desired outcome. This model creates logically proceeding learning path, where all the phases of the learning process forms an own entity. This model isn't constant - it can freely be modified and used according to the own task.

Learning has the nature of process. Pupil forms new information to the basis of earlier created knowledge. In the first phase the pupil forms the inquiry learning problem. He sets the hypothesis to his functions and creates the mind map from processing subject. Into this map he gathers the information already has or is able to find from the study book. The next stage is to search information concerning the subject. Findings and observations from the nearby surroundings have become as distinguished part of the project as the information gathering. These observations are crucial, pupils act like content producers at the same time.

With the gathered information and knowledge the pupil classifies the subject matter and rebuilds the schoolwork. The possible consequences will be considered further through the common classroom discussion. The outcome is that pupil has solved the set problem by following the learning process model. From the pedagogical background the technology is being carried out to a natural part of functioning in classroom and working model. The crucial learning factor, even more important than information, is the learning process itself. (Roschelle & Pea, 2002)

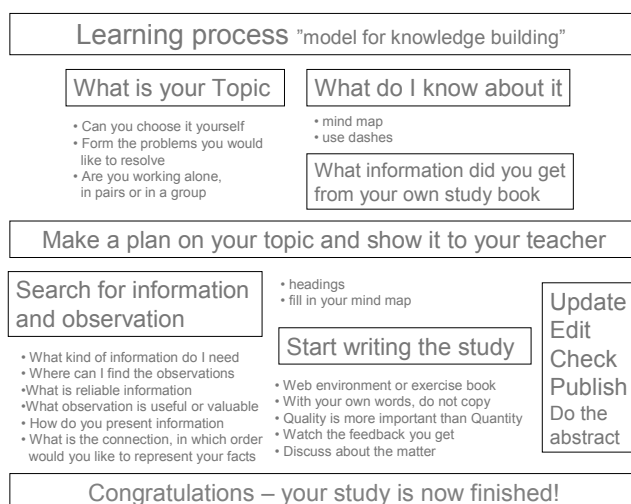


Figure 1. Model of Stages in Knowledge Building Process

### **3. Learning situation**

The aim is to create a model of a learning situation, which can be accustomed further as a support for learning and teaching. It rises from the basis of curriculum to the different school tasks. During teaching process knowledge is being built in a modern and meaningful way. Learning situations from neighbourhood are connected to the curriculum themes. The intension is not to compensate the traditional teaching, rather give more equipment and means to realise it. With real-time feedback and interchange the pupil is guided to do the observations and downstream operations that follow the idea.

#### **Pedagogical Aims by Using Moop**

1) Main principles are based on pedagogical ideas of inquiry learning and creative problem solving and the tasks led from the learning process. During process a pupil lists the previous information and opinions about the task, forms the project plan and through that seeks for more information and observations about the subject. Then the pupil composes the study on a school subject according to the process. Before it is finished it is useful to discuss the subject with others and comment on other students' work. (Edelson & al, 1996; Hakkarainen & Sintonen, 2002)

2) Location-bound task courses are based of path being constructed to the certain area. Pupils make observations in specific task points, which are bound to GPS-location technology. The information gathered from the task points are tied to school learning process and curriculum. Pupils benefit the information collected actively in classroom and share it in cooperation with peers. The knowledge is achieved and applied like in everyday situations.

3) Collaborative project learning is realised through tasks which pupils have to figure out in a group activity. There is a certain time for the task to be finished. To cope with the mission the group has to split in smaller groups, take roles and to communicate with Moop-environment and the tools on offer, for example by using the PoC function. (Dillenbourg, 1999)

To follow the learning process pupils have to analyse their subject, consider the inquiry questions and find the basic information about their subject. With the help of all the information from thinking and analysing the briefing knowledge to the searching new information and collecting fresh observations - based on gathered information - pupil's task is to create the final learning outcome to the network-learning environment. The main issue is construction of the knowledge instead of memorising the facts.

One practical example: According to the legend Mr. Taavetti Lukkarinen was hang to this tree – explore if this could be possible. To form the final answer the pupils have to rebuild the situation and different details, anchor these to education and in real life. The tree has been there so little time that the case is unlikely possible. The pupils have to philosophise to form the final answer by themselves. It is also a didactic challenge to the teacher to form problems like this which require creative problem solving and challenge genuinely the pupils thinking and learning.

The observations are collected to the Moop-environment and are used as a part of schoolwork in net-based learning environment (Riihi). Pupils are able to edit the observations to the appropriate form and construct the mind maps in relation to observations and the existing material. Pupils have a possibility to use phones also at home and do some mobile observations at their leisure time. They are interested and eager to do so and carry on their task there. Mobile phone and the Moop-learning environment are always with learners, as part of a normal life. The overall learning process is demanding. Pupils are deep inside in a subject only after many rehearsal times. Operation can be practised through single observations and examples by constructing the meaningful and motivating learning situations.

#### 4. User interface

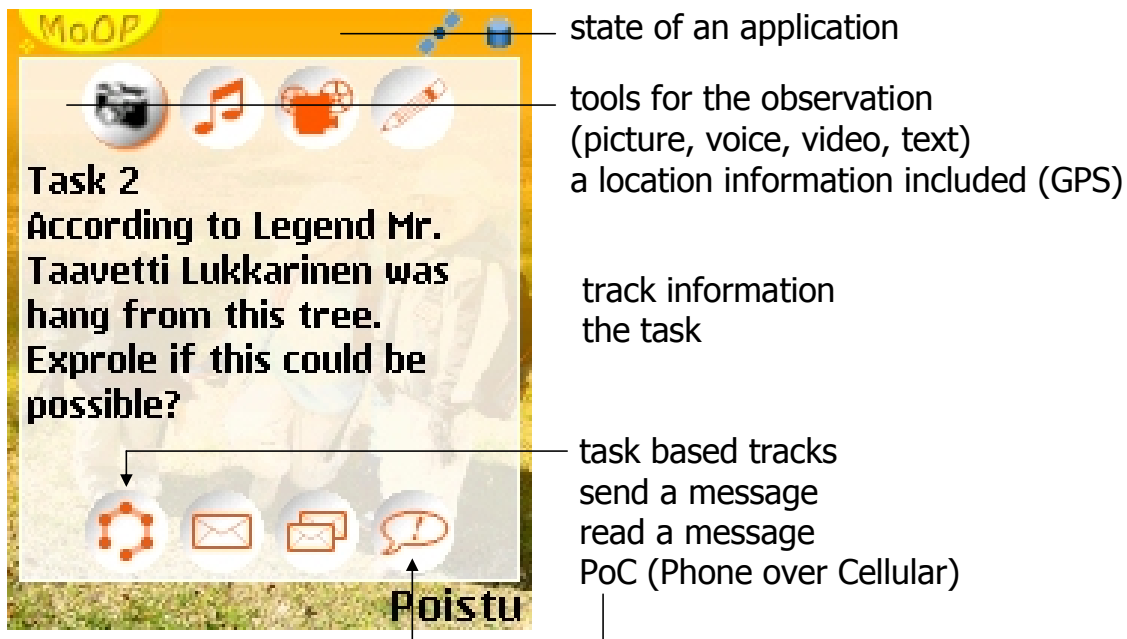


Figure 2. Moop User Interface in the Screen of a Mobile Phone

#### Mobile Phone

In the Moop-project it has been designed a user interface and application working for mobile devices in Symbian S60 operating system (for example Nokia 6630). It includes an observation gallery, an own user interface for management of users and map bases as well as some administrative tools in the Moop-network environment. Moop-observations are utilized as a part of web-based learning environment (Riihi) at the schools in the city of Oulu.

Moop learning environment is a user interface for mobile phones. It collects the teaching features inside the same application. Through Moop the pupil analyzes his/her thoughts and makes observations from the mobile device and carries on the process in network. Moop application has been planned from the basis and needs for primary school pupils. According to the experience the phone and the user interface can be adopted naturally. The user interface planned for primary school learning situations must be logical, motivational and easy to use.

The Moop-project can be described also as a learner centric technology development. The fundamental point is pupils' actions. The demands and benefits can be obtained to the pupils work through m-learning. At the same time it is possible to achieve information about the culture how the youngsters use the cell phones. With this feedback it is possible to continue the developing process and share it straight to pupils' level.

In the first phase was created a platform for collecting data from near surroundings. It enables the observation, saving and sending of phenomenon with the location information from observation point straight to the server. It enables the edition and analysis of raw data in the observation point. The created application was already more than just a tool for collecting observation. It creates the base for learning platform or mlearning environment. It is a surrounding where pupil login with his own username. The mobile terminal is in connection with a server program which transmits the information between mobile terminals, www-browser and data base. In the second phase into the environment has been developed a possibility to build task courses, which enables to form location-bound routes. The returning time and the safety area will be defined into the each route. There are tools for helping to enlarge the cooperation and interaction as PoC (Push to talk) function and features like reading and answering messages inside the Moop.

The application collects the digital data and transmits it to a certain server address by using only acceptable data connection (GPRS/3G). The media transmitted through user interface can be text, photo, video (.3gp),

a report, a record or transcription like voice message, for example an interview (.amr). The equipment used is also a phone and it can be used like a normal phone. With a phone call it is possible to clarify the subject. Pupil has also a possibility to search the task, messages and notes made by teacher or other group of pupils.

Both the teacher and the pupil have a camera phone using the Symbian operating system. The learning tasks are being transmitted through the Moop-application. The class teacher guides the action by setting questions and pupil does the observation and problem solving in a meaningful way from the surroundings. When GPS-locator is switched on the pupil is able to find his own position and the observations taken from the map base. The location information will automatically be attached to every observation and will be transferred to the class room, directly to the school teaching situation. There are more web-based tools to handle and perform the observations in the classroom. In our project we operate with a web-based learning environment called Riihi. The information stored with mobile devices is categorised and specified through logical user interface. The meaning of that information is to fulfil the information found from the study book, as a natural part of school's learning process and curriculum.

### **Moop Network Environment**

Pupils have also Moop-network environment in their use. They sign in with the same username as to their mobile device. The observations made by camera phone are transferred to the network, where those are available to the pupils in their computer or laptop. The pupils operate by using tools on a Moop-network environment or the used web-based learning environment. The observations are listed according to observation group or shooting date. Writing notes can be added as well. The meaning of these messages is to analyse pupils work and thoughts when writing the final outcome. All the observations are presentable and the included text editable in the Moop-environment.

The teacher has also administrative tools. These tools give the teacher wider opportunities, such as run and edit tasks. Admin user has a right to create maps and the location points needed for the GPS-locating. Admin user can plan routes and tasks to the pupils and for their mobile devices. Teacher works as an intermediate between closed and open surroundings. Teacher can remove the pointless observations and also publish good quality works or pupils' material which will be moved to sort of a media bank, from where it can be utilized by the others. Teacher can also transfer the photo straight to the web-based learning environment.

### **The Key Elements in the Moop-Application**

\* Tools for observation: Moop is based on the idea where the application collects the useful features from mobile phone inside the one user interface. Though Moop application user can control a camera, a video camera and a voice recorder features. When GPS-locator is connected the location information will follow observation automatically. The additional information like the shooting time, date, place and the photographer is being recorded. Before the application sends the observation further it must be named or classified by typing. The function is for the analysing the observation purposes straight from the shooting point. It guides to consider more closely the circumstances in the place the observation is made. This information is useful when the learner is building the final study in the classroom situation.

\* GPS-location technology: Maps are located at the server and are downloadable to the user's mobile phone via data connection and GPS-positioning system. A variety of electrical maps, for example guide maps, orientation maps or aerial photo maps, can be used. Before utilization the map has to be transformed into a suitable form and scale. A GPS-locator device can be used in the teaching situation. A location-bound task course is created with the help of a GPS-locator and a user can easily proceed on course to reach the set goals. The defined boundaries limit access to safe and permitted routes only. If a pupil leaves the defined safety area, both the pupils' and teachers' mobile phone notifies them with a voice signal. Planning the route with Moop's map view gives the possibility to plan a variety of learning situations and study plans. With the teacher application it is possible to plan the route directly live on course in the nature and in the observation place. The benefit of geographical location technology has been used in school learning situation when the teacher have planned routes but also when pupils have made roots for themselves and to smaller pupils. (Vygotsky, 1978) Using the maps in primary school learning we can get a great deal of useful information to benefit the teaching.

\* Push to talk – function (PoC, Phone over Cellular): PoC enables a direct voice communication between teacher and / or pupils in a closed environment. The PoC connection is opened with a push of a key (tangent), just like in the old radio phones. Pupils have also noticed the benefit in leisure time or in hobbies when forming closed groups or one to one connections when demand. This feature has turned to be useful in education. PoC connection establishes security. In remote learning situation the teacher or peer group can be activated by pressing just one button. By using the PoC connection it is easy to direct group movements and to give extra information which can be helpful when seeking the solution to a task. It is also realistic to give all introductions through Push to talk connection. This direct call over data connection improves the usage of environment by giving remarkable additional feature to interaction and cooperation tools in the Moop. As an individual application made by the Nokia the PoC-feature was adapted as part of Moop-user-interface easily. The interaction between learners can be also supported by the tools for send and read messages. It is possible to send message bases from one phone to another or form one group to another according the task.

## **5. Utilization of an Experiences and Results**

The operational environment for Moop-project is the primary and secondary school classroom (1<sup>st</sup> to 9<sup>th</sup> grade), which is led and guided by the teacher. The actions occur in real school day situations in three primary schools in City of Oulu, in three classes. The pedagogical developing process is participated three teachers. There are average 20 pupils in a class. The environment and the equipments are in constant use of 60 primary school pupils at the age of 10-12 years (3<sup>rd</sup> to 5<sup>th</sup> grade). During the spring 2005 the environment was used and tested by a thousand novice pupils. Mobile phones are used as much as it is rational from the point of view of learning. Moop-environment and the use of terminals are part of ICT-didactic use in teaching.

The main mission to the teacher is to connect the teaching into practise, branch of study, study material and to the observation of surroundings. This action is put into practice by the utilization of developed learning platform. The new features are being planned according to the need of the environment and contents. Those will also be tested in practise. The existing environment will be developed through the interaction between the school learning, software design technology and the desired user descriptions.

The pupils have been aware of the process and the learning model used. The aim concerning the learning is to define phenomenon, not just to remember pure facts. The attitudes and functions among girls or boys have been quite similar. There have been no significant differences. Pupils have had a possibility to operate the device during evenings and weekends. At the piloting session the amount of phones has been limited and eagerness to run those, also at home, has been considerable.

Based on the experiences on the mobile leaning environment and the knowledge building model, the users have found them to be motivating, encouraging – and in their own language, "cool". They thought that the best outcome was that the only solution didn't find out just by reading the school book, but it was possible to do research, seek and test the best solution by them. At the same time it was possible to learn how to use equipment and how to transfer data of your own picture, voice or text to the network and process them there.

The first pilot was carried out in Korvensuora Primary School (17.-25.5.2004) and contained one school class with 25 pupils. During the piloting project it was taken around 362 mobile observations with image, voice, or video data. The amount of the observations taken was considerable concerning the time and equipments used. Also the quality of data and how significant it was towards leaning was positive and encourage continuing the trial. After the first piloting session the surrounding was developed and supplied with new features, which have been described earlier. During this spring term 2005 there has been stored up to 2 GB observations taken mainly three school classes. The accuracy of observations has improved significantly along the phone models, when an observation can be average 500 kb. The standard of observations rise remarkably when the observer learn by experience and when the observation situation is designed in advance. The utilization of these observations in the school situations does not depend on the quality of a digital data. The observations in the server are originating from school day, home environment, big events, pets, festivals or to the school task. There are so many observations that the classification and searching tools will be emphasized in the continuation development.

The observations are especially valuable, because those are pupils' own. When considering closer the use of Moop-environment and knowledge building process it is noticeable that traditional school teaching will change. Study books made by publishers and photos included in paragraphs are no longer the only source of information – those are an important source among the others instead. Pupils own working process and importance of their own observations are being emphasized – pupils take an active part as content producers. They are not only learning the information nuggets but also the learning process itself which will be useful afterwards in equivalent situations. Pupils' activity and their own working process are emphasized and the role of the teacher is becoming more and more as a mentor of a class, group of pupils or single pupils. The teacher shares the basic information of knowledge management and media education. These skills are important when doing the projects. The value of the information that the pupil gathers from peers and peer groups is more crucial. (Vygotsky, 1978) This depend more communication and interaction skills. Moop-environment includes the tools supporting the process. It is very important to analyse and develop this technology further when there is more evidence of utilization in school practise. Overall the function teaches responsibility and ethicality how to use this kind of system. It can be described as a sort of mobile etiquette which will be practised in a closed group.

In the future the effort is to increase the work with mobile terminal. It leads the learning process in distance. The stages will be integrated to network learning environment working, your own study process and a class schedule. Bidirectional data transmission is part of the process and the environment is working as a tool for knowledge building. Practically this means that the learner analyzes the observation before it is made and learner can benefit from this information when and where ever. With this information the learner can edit the working plan and affect the course of process. The possibility to suggest comments to the work and observations by others is improved and that will affect directly to the own working process.

When the pupils are familiar with the surrounding, it is possible to establish cooperation between classrooms and teamwork between the teachers. Pupils are able to do larger projects and those can benefit from other pupils at the same or completely other circumstances, for example in the natural science projects. The learning process and utilization of ICT-technology in the teaching educate to the information gathering and managing process. This forms an important base for future learning and missions of life. In addition to the learning the thinking and the view of life is expanding and becoming as part of everyday life.

## **6. Conclusions**

Through Moop mlearning environment it is possible to reform the culture of openness, based on sharing the information and cooperative learning. Open discussions held with interactions between peers are leading towards the group shared knowledge and at the same time the standard of knowledge of an individual learner is rising. By using the right learning environment it is possible to support the knowledge building process in a way we can achieve the understandable and profound learning results. The benefit from using the learning environment is to practice the information and abilities which can be useful to the citizen of tomorrow's information society. Pupils are operating rationally and responsibly with mobile phones, by given instructions. Experiences with these mobile terminals have shown that it is a meaningful tool for primary school pupils and part of learning process. The tool has been motivating and easy to use and it benefits the situation in practice by supporting the learning process and helping the classroom functions.

Moop affords a useful opportunity to do problem based observations from nearby surroundings. According to a pattern of working model the teacher can create learning situations that the pupil can solve through own planning, actions and reasoning. The pupil reached a unique learning experience that is not dependent on any school books. Through given tasks the pupil makes observations from neighbourhood, for example the recycling process at home, respond the matter and influence the decision and way of action at home. By following that mode of action the pupil can directly affect the decisions and actions in surroundings. The noteworthy observations can be taken from the same position at a different time or different angle by different pupils according to task. The remarkable observations are as well the unique observations which will appear suddenly and are valuable to record for further examination. Through Moop-environment and a camera phone pupil can look at the living surroundings by open eyes.

The solutions used in Moop-environment efforts to increase security. A task course is created with the help of locating technology and a user can easily proceed on the course to reach the set goals. The defined

boundaries limit access to safe and permitted routes only. Teacher is all the time aware of the pupils' location, their progress and the time used on the task course. If a pupil leaves the defined safety area, both the pupils' and teachers' mobile phones notify them with a voice signal. The teacher and pupils can communicate real-time through the mobile phone's PoC connection while outdoors and make focusing questions. Regardless of task based routes it is possible to do Moop observations from normal surrounding in every day school situations and on a way to school, at home or in hobby. Mobile phone is generally part of everyday life.

One of the main aims is by working together to find new innovations in teaching and the pedagogical teacher work. From the experience learned in this project mlearning and Moop-environment are suitable ways to benefit in different learning objects and fit to as part of primary school everyday learning process. Before the cell phone is considered as a prohibit tool for classroom, although for children it's quite natural tool for communicate. This Moop-project has been start from the idea, if it is possible to find real, true and useful subjects of benefit the camera phone in school and as part of learning process. The children don't accept to do things in a one certain way. It is allowed to do mistakes in school learning and the activities are being prepared in closed surrounding.

## Basic education "model for knowledge building"

future information society skills

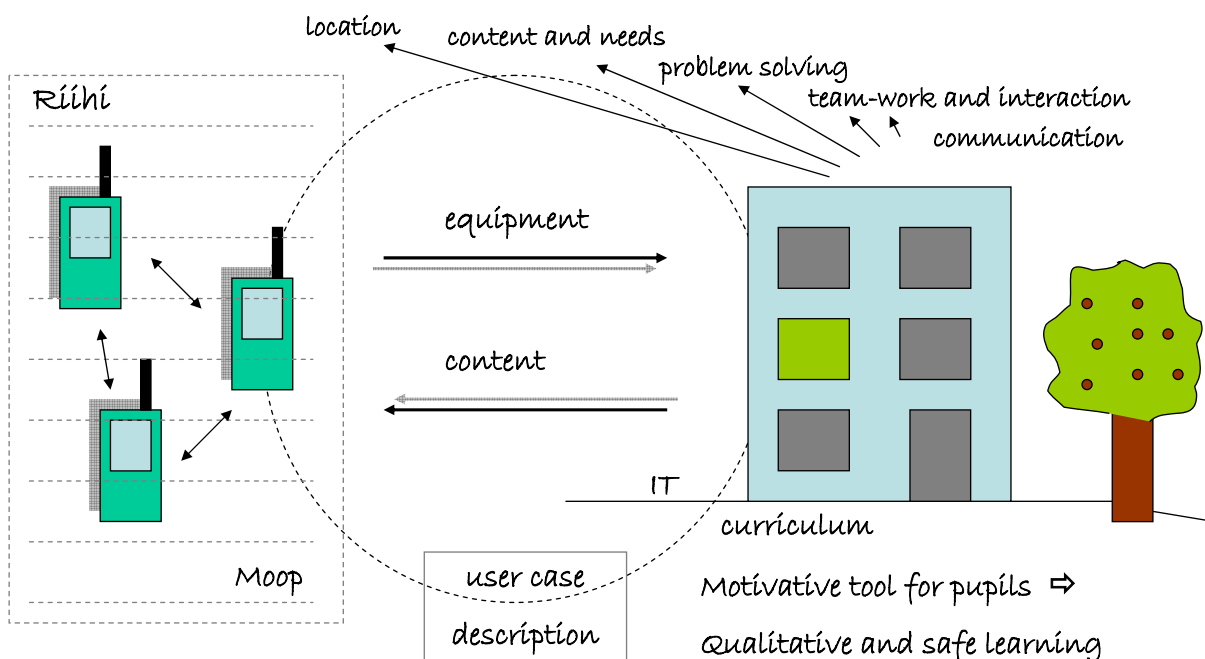


Figure 3. Developing Aims

Moop is used as a certain learning model in the classroom. When you look at the outcome of the learning results and pupils work you realize how much essential matter about teaching subject those include – mind maps, mobile observations, concept explanations and the text pupils can form through the whole model. The observations pupils make are saved to the server, to the digital data storage which is growing gradually and will be in use of all the pupils using Moop. Little by little all the mobile services become merged in school system. It develops and brings its own benefit to the existing learning solutions. The idea is to build own learning portfolio which goes together to the following school level. The building tools during the project are possibly opening the channel to make cooperation between parents and school. School with the information get nearer to pupils home and for parents it's easier to stay in contact with the school – when the one natural goal for learning starting point will be the problems raising from own neighbourhood.

## **7. Future research**

Moop mlearning project is in a way of "expedition" journey during which we are building something new and as far as concerning about user's learning process – we have to let space to do some experiments. There are no certainty towards we are heading. Progress takes place little by little through the feedback we can get from users and by following and reporting the function and advance. In the educational matter the user interface set up large pedagogical challenges, which will be interested to consider by doing research and practical teaching in normal school day.

## **8. Acknowledgements**

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