Build and evaluate - cycle 5

Moop

Moop is a mobile learning environment developed by the software house Incode Oy (from Oulu Finland) especially for situations where primary school pupils use a mobile phone to analyze their surroundings and to communicate within groups. A pupil makes observations and saves and manages information in the mobile and network learning platform. 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. (Mattila 2005)

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. With ICT-technologies we can give support to the pupils learning process. Mobile learning environment has to adapt as a natural part of the daily schoolwork and pupils class schedule. (Mattila 2005) So Moop project doesn't see mobile learning as distinct section in schools, but wants to integrate it to ordinary school work and curriculum.

In the Moop-project it has been designed a user interface and application working for mobile devices in Symbian S60 operating system. It includes an observation gallery, a 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. (Mattila 2005)

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 (GPS-data) from observation point straight to the server by using data connection (GPRS/3G). The media transmitted through user interface can be text, photo, video (3gp file),a report, a record or transcription like voice message, for example an interview (amr file). Platform enables the edition and analysis of raw data instantly in the observation point. Pupils login with their own usernames to the MOOP-environment. The mobile terminal is in connection with a server program which transmits the information between mobile terminals, www-browser and data base. (Mattila 2005)

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. Also tools was build for helping to enlarge the cooperation and interaction as Push to talk function and reading and answering messages inside the Moop. (Mattila 2005)

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. With GPS-locator 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 to the school teaching situation. There are more web-based tools (Riihi) to handle and perform

the observations in the classroom. The information stored with mobile devices is categorised and specified through logical user interface. The meaning of that information is to fulfill the information found from the study book, as a natural part of school‘s learning process and curriculum. (Mattila 2005)

Pupils have also in their use Moop-network environment, where 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 (Riihi). 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 analyze pupils work and thoughts when writing the final outcome. (Mattila 2005)

The teacher has also administrative tools, which 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 can remove the pointless observations and also publish good quality works or pupils’ material in the bank, from where it can be utilized by the others. Teacher can also transfer the photo straight to the web-based learning environment (Riihi). (Mattila 2005)

Moop is based on the idea where the application collects useful features (a camera, a video camera, a voice recorder and GPS-locator) from mobile phone inside the one user interface. 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 analyzing the observation purposes straight from the shooting point. It guides to consider more closely the circumstances in the place the observation is made and this information is useful when the learner is building the final study in the classroom situation. (Mattila 2005)

Maps are at the server and are downloaded to the user’s mobile phone via data connection and GPS-positioning system. Before utilization the map has to be transformed into a suitable form and scale. A location-bound task course is created with the help of a GPS-locator and a user can easily proceed on course. 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. (Mattila 2005)

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. 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. The interaction between learners can be also supported by the tools for send and read messages. (Mattila 2005)

The pedagogical principles in Moop project are: inquiry learning, skills for gathering information and building knowledge, creative problem solving and leading to the interactive and cooperative learning. (Mattila 2005)

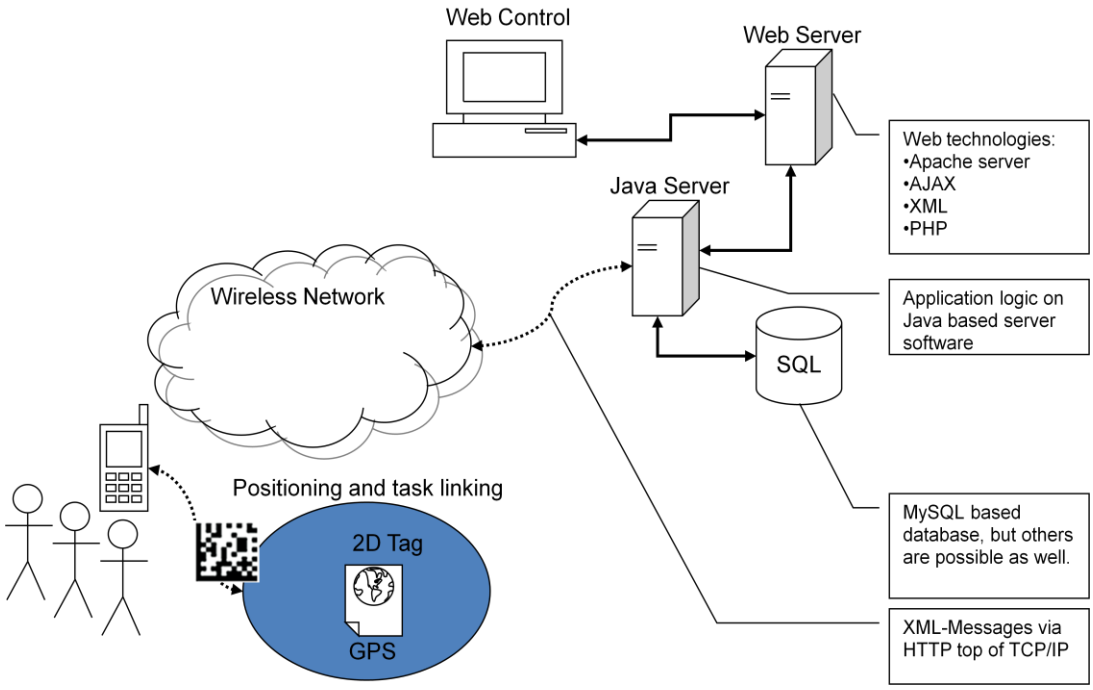


Figure1 from http://webanet.ucs.fi/webanet/brieftec-binder-mobiilisovellus/

In figure 1 there is chart of technology used in Moop system.

Binder and Opit

Brieftecy Ltd. commercialized Moop environment with name Binder. The Brieftec Binder mobile and web based learning environment, was launched into the market 2006. It has received international recognition by receiving the Microsoft Worldwide Innovative Teachers Award 2006 - in the community innovation category.

In 2008 Brieftec started co-operation with Wsoy Opit. Wsoy is the main publisher of learning material in Finland. 'Opit' is a ICT-based (web-based) full-service learning environment by WSOY. Schools around Finland use it and in 2008 the total amount of users was over 150 000 (Laakso 2010).

Opit is designed for supporting collaborative pedagogical practices in schools. It includes several tools for this purpose: a discussion forum, personal and shared (group) portfolio files, project management tools and lots of learning objects related to the subjects of curriculum of Finnish comprehensive and secondary school.(Ryymin 2008)

In Brieftec Binder web environment teacher can make tasks, routes and manage observations made by pupils. Observations include photo or video taking by pupil, shooting time and place on the map (Goolge Maps). In the web environment it is also possible to share observations in the social media like Facebook. In

Opit learning environment it is possible upload observations from Binder web environment and so add them for example to Opit discussion forum.

Lempäälä municipality bought Opit Binder service for two years. This service included 6 Nokia phones with Binder java application installed and 3G data connection included, Brieftec Binder web environment and Opit learning environment. The price of the system was high, but we got 70 % state subsidies from learning environment project of The Finnish National Board of Education.

Case 1: forestry education task course

I tested first time Opit Binder on spring 2009 with Teemu Nieminen's 5 th grade pupils on Sääksjärvi primary school. Near the school there is ready forestry education task course with pathway, control points and tasks. We make some edition to tasks. The length of pathway is one kilometer and original tasks are made by The Finnish Regional Forestry Network and Game Management District.

Making of the tasks and courses

I first explored course on the map and checked ready tasks. I made safety area round the pathway. Then I went to the forest and with mobile phone application and GPS and I made control points to the pathway. It is impossible to made control points with network map solution with computer, because it cannot be done exactly enough.

The ready tasks of forestry education task course were not useable, so teacher of class Teemu Nieminen made some changes to the tasks.

1. Take a photo from your group. Write your names to the paper.
2. Mosses: Look for three different types of moss. Take a photo and add a name of the moss to the photo. Please write in the paper "There are many mosses"
3. Growth places: Take the overall photo on the left and the right side of the path. Identify the most common tree on the each side. Why situation is different on the left and the right side of the path. Look and take a photo from the giant stone (boulder).
4. Warren: Why the ants are useful animals for wildlife? Write to the paper two reasons.
5. Fin: Seek the marsh tea and take a photo. Please write in the paper how the swamp trees look like and why.
6. Logging: Why are forests being harvested? Please answer to the paper.
7. Build a cone cow.
8. Watch for wildlife when your walks from this check point to the next one. Do you see a tree, which roots are on the surface of path. Answer to the paper.
9. How you should do, if you stray into the woods. Answer to the paper.

Long textual answers we decided to ask pupils wrote to the paper, but all questions come from mobile phone (with peep sound) when group was at check point controlled by GPS. There were four questions, where pupils take photos.

We found, that the biggest question with these kinds of mobile tasks is connecting to the curriculum. What happens in the class before and after mobile task course? The task course cannot be separate event

without gripping surface to ordinary school work. When some observations are made on the course in the forest, how these can be exploited on the class work? There are not available ready pedagogical models. When this kind of system is sold to the school, these ready pedagogical models must be included to the commercial product. Without these models teacher uses mobile learning only once and says that “this was nice experiment but so what”. Teachers don’t get from teacher education capacity to make this kind of pedagogical models himself or we doesn’t have time to make pedagogical planning needed. A lot of pedagogical support and ready maid learning objects are needed when starting mobile learning on ordinary schools. Opit Binder was not pedagogically commercialized as much should need.

Another big issue is how to develop mobile task courses evenly throughout the year. Fall and spring are a good time for the task courses, but how about winter? Is it so, that we must in the winter use mobile learning mainly indoor like in museums? Mobile hardware and software are, however, a big investment, so we should find enough use throughout the year.

Technology

Students became familiar with equipment and experimented use of mobile application before entering task course. This is necessary that pupils can concentrate to tasks, not use of technology, when they are in the forest.

Mobile learning technology is not so mature than ordinary computer technology. We have lots of hiccups with equipment. Mobile map from which pupil can watch on real time how he or she is walking in the forest was not accessible even if it is part of the functionality of system. So there was a bug in the system. This was not a big problem for us, because pathway was clearly marked on the woods. This functionality is imperative if course is not marked on the terrain.

When a pupil walked to the control point, a task was arrived to his or her phone with peep sound. Screen of the phone Nokia N70 was small and you cannot scroll the text on the application, so it was not possible to make quite complicated tasks which need a lot of text. It would be nice, if you can put pictures or speech to the task.

Some pupil’s mobile phone application crashed down and it had to be restarted. I ran pathway back and forth to guide the students when problems came up. In this type of task courses it is good if technical support person is available to the students. Teacher cannot solve alone all technical problems encountered.

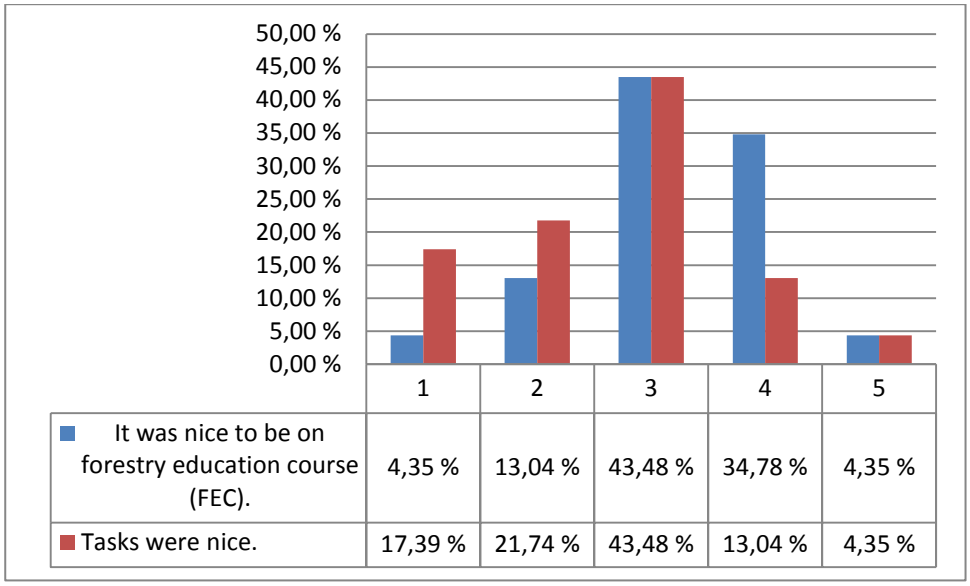
Nokia N70 did not have integrated GPS functionality, but using separate GPS device connected with Bluetooth to the phone. Management of two devices was not so easy for pupils, especially when phone must restarted and connection between phone and GPS device was not activated for some reason. This Nokia N70 was not best choice for Opit Binder device. It is not reasonable to use cheap old phone models in commercial mobile learning products.

We also found, that if check points are too close together, pupils can mix tasks. It would be good that distance between check points is at least 50 meters.

Survey for pupils

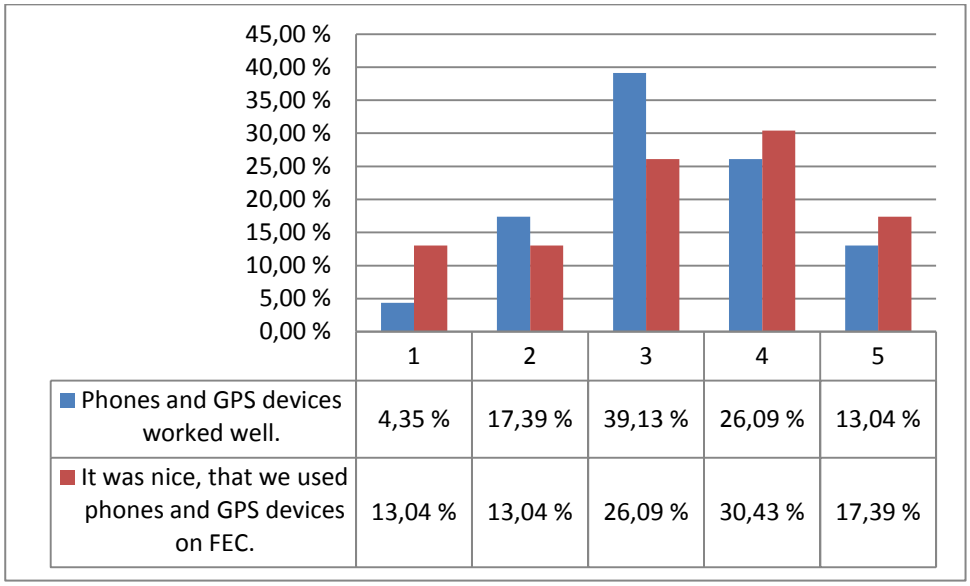
On the class there were 12 girls and 10 boys. They have all own mobile phone and all can use computer at home. We have only six mobile phones with application on the task course, so pupils made tasks in the groups. Nine of 22 pupils used Opit Binder on the pathway.

We used Likert scale in some questions : completely disagree (1), disagree strongly (2) , agree slightly (3), agree strongly (4) and agree very strongly (5).



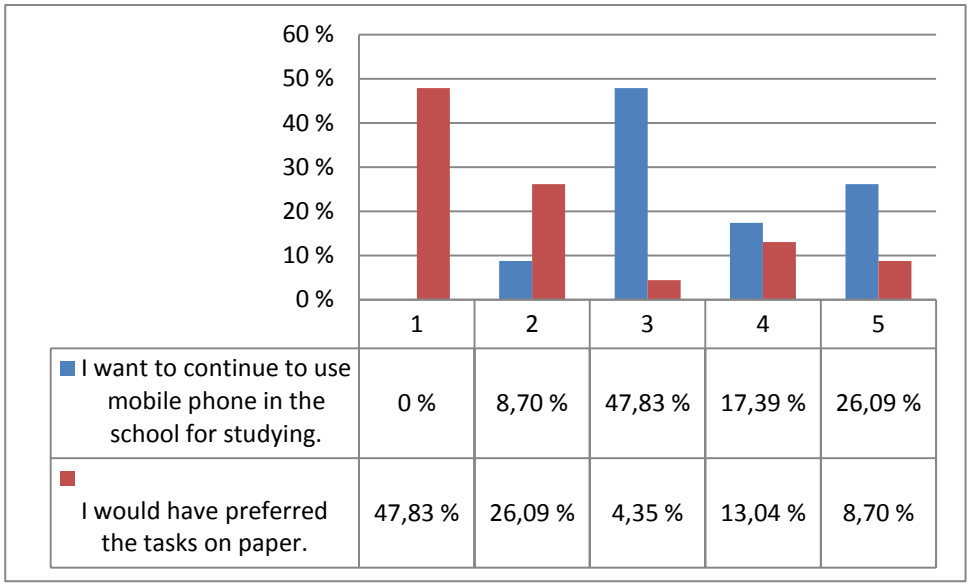
	1	2	3	4	5
It was nice to be on forestry education course (FEC).	4,35 %	13,04 %	43,48 %	34,78 %	4,35 %
Tasks were nice.	17,39 %	21,74 %	43,48 %	13,04 %	4,35 %

Pupils like to be on the forest, but tasks were not so nice.



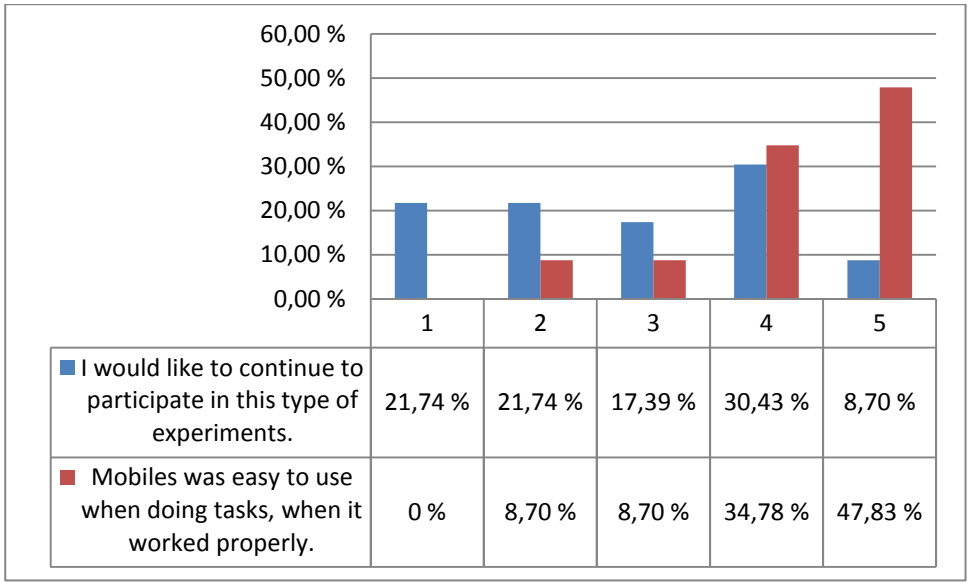
	1	2	3	4	5
Phones and GPS devices worked well.	4,35 %	17,39 %	39,13 %	26,09 %	13,04 %
It was nice, that we used phones and GPS devices on FEC.	13,04 %	13,04 %	26,09 %	30,43 %	17,39 %

Pupils don’t were so critical to technical problems met and they liked to use mobile technology.



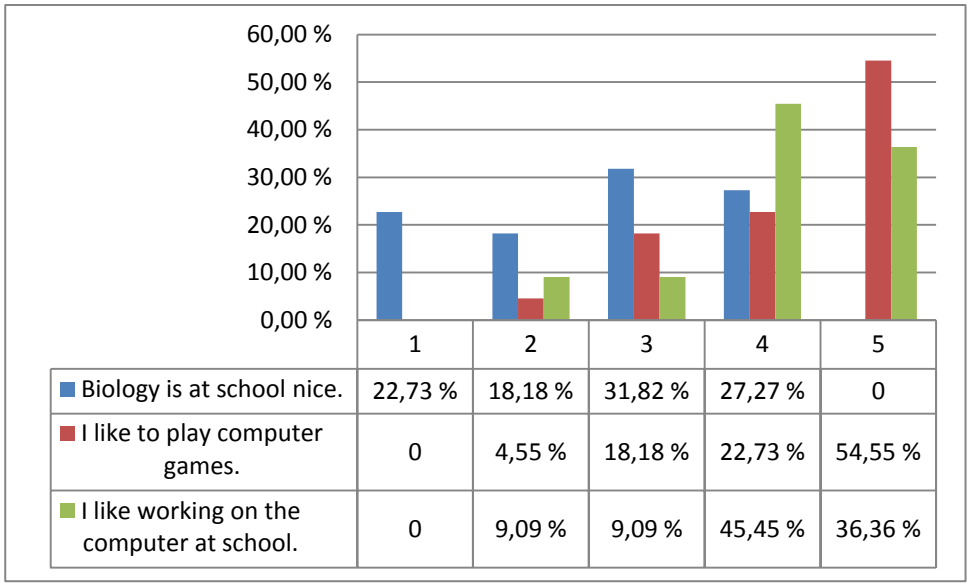
	1	2	3	4	5
I want to continue to use mobile phone in the school for studying.	0 %	8,70 %	47,83 %	17,39 %	26,09 %
I would have preferred the tasks on paper.	47,83 %	26,09 %	4,35 %	13,04 %	8,70 %

Pupils want to use mobile technology to studying also in the future. Some pupils wanted to have tasks on paper, but not so many.



	1	2	3	4	5
I would like to continue to participate in this type of experiments.	21,74 %	21,74 %	17,39 %	30,43 %	8,70 %
Mobiles was easy to use when doing tasks, when it worked properly.	0 %	8,70 %	8,70 %	34,78 %	47,83 %

Forty percent of pupils don't want to take part this kind of experiments any more. Pupils found mobiles easy to use.



	1	2	3	4	5
Biology is at school nice.	22,73 %	18,18 %	31,82 %	27,27 %	0
I like to play computer games.	0	4,55 %	18,18 %	22,73 %	54,55 %
I like working on the computer at school.	0	9,09 %	9,09 %	45,45 %	36,36 %

I used analysis of variance to all variables and found that girls want tasks on the paper more than boys. Maybe girls are more orientated to tasks than to technology. Result is only statistically almost significant.

```
> AnovaModel.1 <- aov(paperiparempi ~ Sukupuoli, data=M)

> summary(AnovaModel.1)

Df  Sum Sq Mean Sq F value  Pr(>F)

Sukupuoli    1  5.6379  5.6379  4.1278 0.05568 .

Residuals   20 27.3167  1.3658

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Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

> numSummary(M$paperiparempi , groups=M$Sukupuoli,
statistics=c("mean", "sd"))

mean       sd  n
Poika 1.400000 0.6992059 10
Tyttö 2.416667 1.4433757 12
```

Some correlations were calculated also.

```
Pearson's product-moment correlation

data:  M$bilsa and M$polullakivaa
```

t = 4.4928, df = 20, p-value = 0.0002224

alternative hypothesis: true correlation is not equal to 0

95 percent confidence interval:

0.4094898 0.8702942

sample estimates:

cor

0.7087385

"It was nice to be on forestry education course" and "Biology is at school nice" correlated quit strongly with each other. 50% of the variability in "It was nice to be on forestry education course" can be explained by the variability on "Biology is at school nice". "It was nice to be on forestry education course" has not correlation with "I like to play computer games" and "I like working on the computer at school". Maybe we can think that for student's content is more important than technology.

Some open questions was put to pupils:

What on forestry education course was the nicest?
- "mobile phones when we do something with them"
- "taking pictures and walking on the woods"
- "tasks game from phones"
- "taking pictures of plants and all the stuff"

What was the most boring?
- " the equipment doesn't worked, and that at every check point must be correcting"
- "when the cell phone did not work at some point"
- "return journey"
- "look for them to be pictured"
- "being in the woods"
- "mobile phone use"

What was the hardest with cell phone?
- "because it went from the place immediately away"
- "it did not work"
- "when it did not shown the tasks, and sometimes it did not send pictures"
- "it does not always function properly"
- "GPS device start-up"
- "that it not shown task in the right place"
- "sending because sometimes it did not send it"

What was the hardest with cell phone?
- "taking a picture" (8 for the same answer)
- "well, then when it got to work so it worked pretty well"

Teacher's feedback

Teacher of class Teemu Nieminen give also some feedback:

Forestry educational path worked as general level well. Devices give motivation to the pupils. Positive was also that pupils could make functional task, which were however easy to the teacher to evaluate. It was important to try mobile application with pupils before going to the forest, so they can concentrate to the tasks. Technical support was important on the path, because there were many technical problems.

The rounding of the learning path went well after the initial difficulties. The students were enthusiastic and involved in co-operative learning. Many things about biology teaching contents was learned certainly better than if they had just studied the book. Writing tasks are cumbersome with phone, so it is better to use more sounds and images.

Case 2

The second Opit Binder experiment was autumn 2009. We got a new version of software, which we tested on museum education at Kuokkala museum road. We have also a new phone model Nokia 6220 Classics. The new version with this new phone model worked better. There were not so many technical hiccups, but some problems encountered anyway.

Because some check points were indoors and museum area was quite small, we do not used GPS but 2D-tags. We set tag near the task area and when pupil takes a photo from the tag the task about that area comes to the phone. If shooting of the tag does not worked, pupil can also give the number of the task and so get the right task.

Kauppa ennen ja nyt /154/

Aleksanteri Eskola piti kauppaa vuosina 1913-1974. Miten kaupassa asiointi hänen aikanaan poikkesi asioinnista esimerkiksi S-market Lempäälässä? Esitä erot ottamalla kuvia kauppamuseosta

Kuokkala Museum is a local history museum and its almost originally preserved yard has many little special museums: Shop Museum, Barber Museum, Shoemaker's Shop, Blacksmith's Workshop with a section for driving tools, War Veterans' Traditional Chamber as well as the Hut of Kustaa Puskema. The most notable of these is the Shop Museum. It's one of the oldest shops in Lempäälä, built in the beginning of the 20th century.

Tasks produce museum guides, and they were very successful pedagogically. Pictures here are from the pupils answers.

1. Trade, then and now.
Alexander Eskola was a trader in this shop 1913-1974. How shopping was different in his time compared to the S-market Lempäälä today? Show difference by taking pictures of the Shop Museum.

2. Barber.
How does development of the barber tools appears in then Barber Museum? Choose one of the tools and show its development by taking pictures of Barber Museum.

3. Shoemaker.
Your shoes are probably made in factory. In the past, however, shoes made by hand. If the shoemaker should be prepared your shoe, what kind of shoe manufacturing stages there should have been? Give the answer by taking pictures.

4. Rear veranda

The back porch is full of old household goods. Shoot one strange object, and invented a name for it and tell what the purpose of the object is.

5. Chimneyless

Kustaa Puskema lived in this chimneyless in the turn of 1800-1900 and maintain himself as making of shoes. Shoot sequence, with at least five pictures of Kustaa's everyday life.

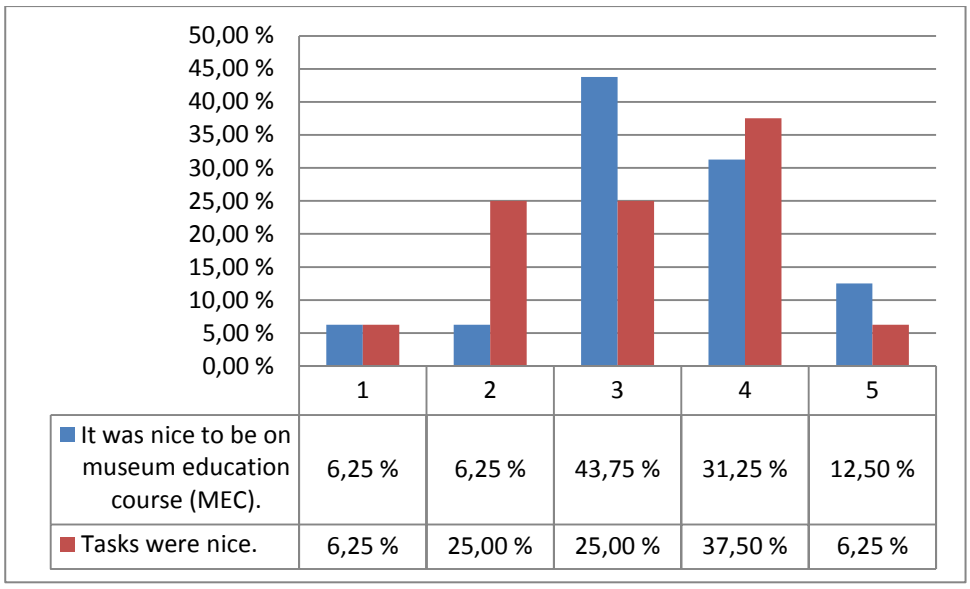
6. Smithy

Smithy of K. A. Koskinen was completed in this place in 1910. What may have been manufactured in this smithy? Shoot for at least five pictures.

Survey for pupils

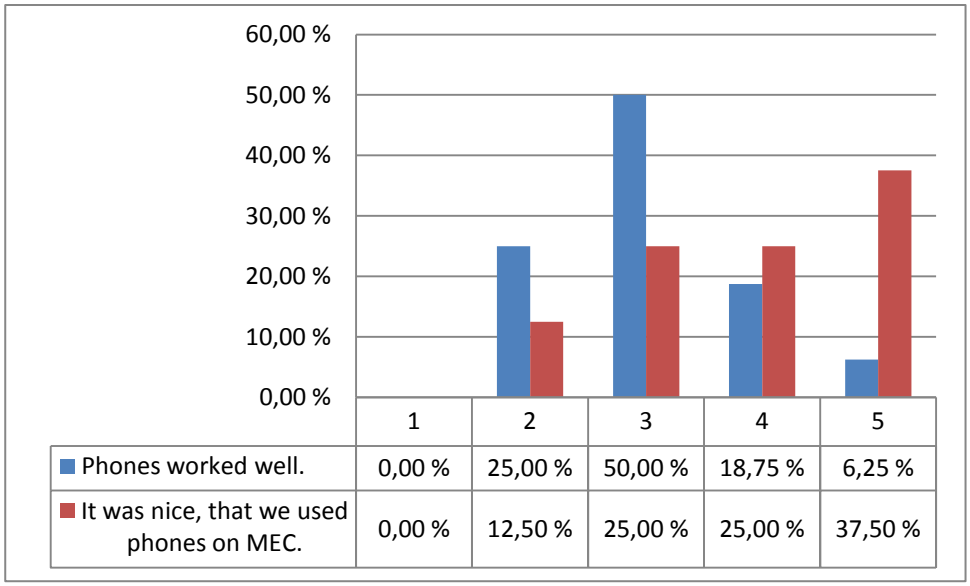
The pupils were from 5th grade.

On the class there were 8 girls and 8 boys. They have all but one own mobile phone and all can use computer at home. We have only six mobile phones with application on the task course, so pupils made tasks in the groups. All pupils used Opit Binder application on the museum course.



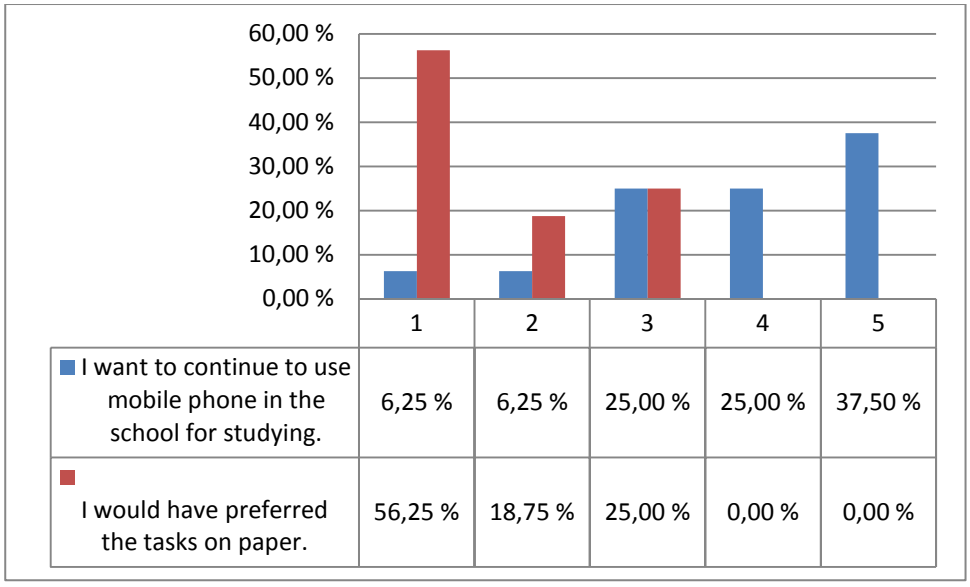
	1	2	3	4	5
It was nice to be on museum education course (MEC).	6,25 %	6,25 %	43,75 %	31,25 %	12,50 %
Tasks were nice.	6,25 %	25,00 %	25,00 %	37,50 %	6,25 %

Over 40 % of pupils like to be on the museum and over 40 % of pupils found tasks nice.



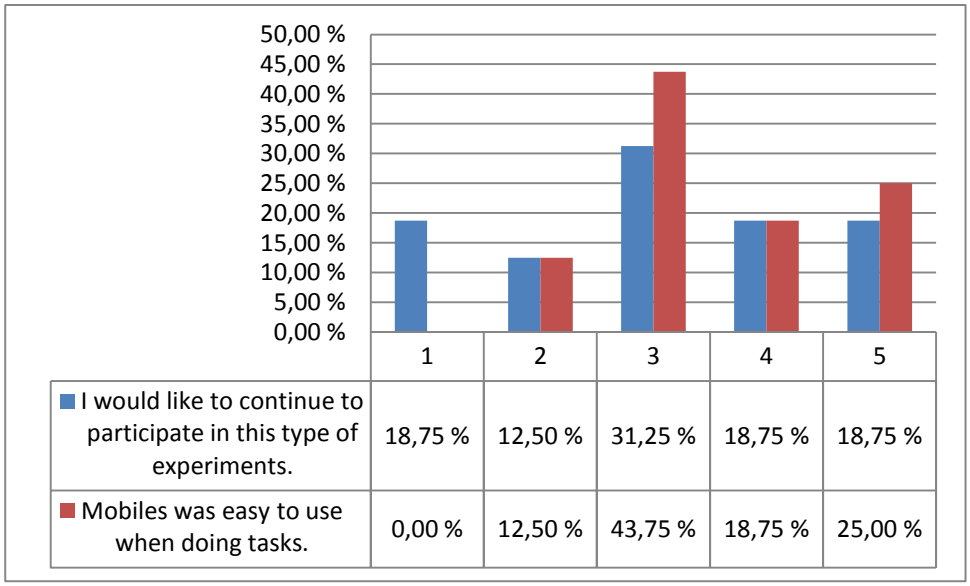
	1	2	3	4	5
Phones worked well.	0,00 %	25,00 %	50,00 %	18,75 %	6,25 %
It was nice, that we used phones on MEC.	0,00 %	12,50 %	25,00 %	25,00 %	37,50 %

Pupils found some technical problems, but they liked to use mobile technology.



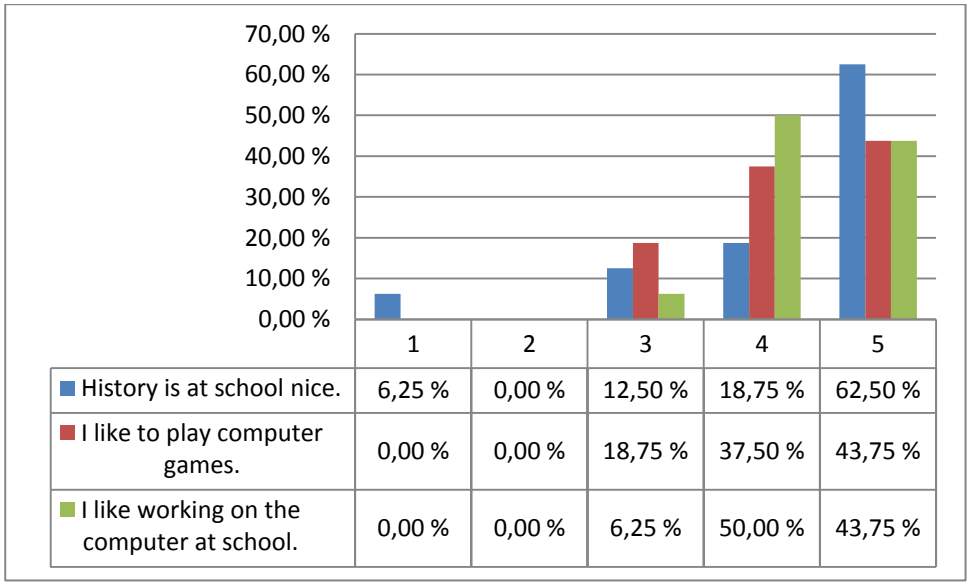
	1	2	3	4	5
I want to continue to use mobile phone in the school for studying.	6,25 %	6,25 %	25,00 %	25,00 %	37,50 %
I would have preferred the tasks on paper.	56,25 %	18,75 %	25,00 %	0,00 %	0,00 %

Pupils want to use mobile technology to studying also in the future. Pupils doesn't want to have tasks on paper.



	1	2	3	4	5
I would like to continue to participate in this type of experiments.	18,75 %	12,50 %	31,25 %	18,75 %	18,75 %
Mobiles was easy to use when doing tasks.	0,00 %	12,50 %	43,75 %	18,75 %	25,00 %

Thirty percent of pupils don't want to take part this kind of experiments any more. Over forty percent of pupils found mobiles easy to use.



	1	2	3	4	5
History is at school nice.	6,25 %	0,00 %	12,50 %	18,75 %	62,50 %
I like to play computer games.	0,00 %	0,00 %	18,75 %	37,50 %	43,75 %
I like working on the computer at school.	0,00 %	0,00 %	6,25 %	50,00 %	43,75 %

Pupils like history at the school and working on the computer at school.

Some open questions was put to pupils:

What on museum education course was the nicest?

- "using of mobile phones" (three answers)

- "When you got to be with friends and take pictures :)"

- "taking pictures " (six answers)

What was the most boring?

- “when phone doesn’t work” (two answers)

- “phones” (two answers)

- “(some of) the pictures were fuzzy” (two answers)

What was the hardest with cell phone?

- “taking photos”
- “taking accurate photos”

How you would do the system better?

- “by making camera better”
- “by making camera more accurate”
- “zoom”

With all pupils of this both cases I checked, was it really so that girls want tasks on the paper more than boys. Now result was statistically significant.

```
> AnovaModel.2 <- aov(paperiparempi ~ Sukupuoli, data=Moop)


> summary(AnovaModel.2)

             Df Sum Sq Mean Sq F value   Pr(>F)

Sukupuoli     1  8.853   8.853  8.8037 0.005315 **

Residuals    36 36.200   1.006

---

Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1


> numSummary(Moop$paperiparempi , groups=Moop$Sukupuoli, statistics=c("mean", "sd"))

           mean       sd  n

Poika 1.333333 0.6859943 18

Tyttö 2.300000 1.2182818 20
```

Teacher's feedback

Teacher of class Juho Knuuti:

We discussed on school about the input of MEC, but we don't moved photos to the Opit system. The course was meaningful and with tasks, students had to explore the museum more accurate than normally and more rationally way. About the use of cell phones and Binder I would have liked a little more comprehensive guidance. Binder customer service I received good help. The pilot went well, we did not have bigger problems with cell phones, but the quality of the images is not fully been good. Was the reason in users or devices, but some of the pictures are very fuzzy. As a single experiment, the course is only a discrete thing, but combined with a larger whole it would be a very good package. Some students were sour, but I believe that most pupils felt that MEC was meaningful. I recommend the museum course with these tasks for 5-6 graders, as long as the students are familiar with the equipment and the course is a part of the larger whole of history lessons.

Lessons learned

1. Opit Binder was the first commercial mobile learning environment in Finland and has not yet any competitors. The price was too high especially in this economical situation in Finnish municipals, that's why it is not widely speared.
2. It is clever idea to connect mobile learning environment to traditional web learning environment, which are quite popular nowadays in Finnish schools. Maybe this integration should be more fixed so that for example Opit discussion forum can used from Binder application on the phone. Now Binder is only channel for collecting data in relation with Opit.
3. Ready to take use pedagogical models are needed inside this kind of commercial products. It is impossible to sell this kind of products to teachers if there is not easy ideas about it how to use observations from forests and museums in the school after field trips. Binder is in principle pedagogically well thought and planned learning environment, but it needs some teachers guide book included for us ordinary teachers.
4. Binder was not technologically ready when it was sold to the customers, but this is typical in many new fields of technology. Drummers sell products out before engineers get them ready.
5. Mobile devices used in commercial mobile environments should be quite new models with enough stability, processor power and big screen. Mobile terminal should not be the weakest link in the chain.
6. Mobile data connections are not so stable and all time available than fixed internet connections. With GPS there is also some delay some times.
7. Teachers that used Opit Binder do not have Opit learning environment in active use any more 2009 and 2010. Lempäälä Muncipal was cutting costs and Opit was one of the first savings target. If teachers would have been active user of web learning environment, maybe pedagogical use of observations would been easier in the classroom. We were jumping directly to mobile learning without e-learning and maybe that was the reason why pedagogical integration of course to ordinary class work was found problematic.

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