

Mobile Learning for COOL Informatics

Cooperative Open Learning in a Vocational High School

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Abstract: COOL Informatics is a project that wants to foster informatics education in primary and secondary schools by integrating it in different subjects. The term “COOL” references to the following approaches: (1) to the Austrian teaching model COOL – COoperative Open Learning, (2) to CComputer-supported Open Learning as well as (3) to the adjective “cool” in the sense of motivating and useful. Mobile Learning with mobile phones and tablets is one part of COOL Informatics as it covers all three approaches. From our experiences and the results of former discussions with students we can say, that technology-supported learning seems to be more motivating and “cool” than traditional learning methods. This is one reason why we introduced mobile learning in our vocational high school of commerce and tourism. The paper describes the steps of the implementation from workshops for the students over mobile learning in language lessons to app programming in Applied Informatics for cross-curricular learning. Finally it reports on the evaluation of the workshops and the project on app programming.

1 INTRODUCTION

Students are „digital natives“. They grow up with technology and they use it in their everyday life. Lundin et al. (2010) mention that “Mobile IT is becoming one of the most commonly used tools in our everyday live.” So why not use mobile phones and other mobile devices in classrooms? Especially mobile phones play an important role in the students’ life and most of them don’t even turn them off in the classroom. Although this is a nuisance, as some teachers may reply, it could also be a very useful resource and have benefits for learners as well as for teachers (Corbeil and Valdes-Corbeil, 2007; Traxler, 2007).

Especially for language learning, mobile devices offer plenty of possibilities and may be integrated in the classroom as well as in informal learning settings. (Chinnery, 2006; Sabitzer and Bischof, 2012)

This paper reports on the introduction of mobile learning as a part of the project “COOL Informatics” in an Austrian vocational school of commerce and tourism with students between 14 and 19 years.

It describes the introductory workshops for students and two approaches to mobile learning: the use of smartphones and tablets in foreign language

lessons and the project “App-Programming with the App-Inventor” in Applied Informatics. Finally, the evaluation and outcomes of questionnaires given before and after the workshops are presented as well.

2 MOBILE LEARNING AND COOL INFORMATICS

COOL Informatics can be interpreted in different ways as proposed in (Sabitzer and Pasterk, 2013). All of the three interpretations want to improve the learning process by considering how the brain works in educational context.

- COOL as “cool” describes learning situations in a sense of interesting or fun. One advantage of such situations can be that the neurotransmitter dopamine is released. That happens when for instance people are curious or have fun and dopamine supports learning and memory functions (Wise, 2004). Learning by playing would be an example for this interpretation.
- COOL as COoperative Open Learning (Hölbling, Wittwer & Neuhauser, 2011) means an approach to handle the heterogeneity in classrooms and to promote soft-skills like communication competence or responsibility. It bases on

concepts from progressive education and emphasizes on cooperative aspects of learning. They support the longtime memory because the required recalls from memory during the cooperation lead to a re-storage and hence better storage (Brand and Markowitsch, 2009).

- COOL as Computer-supported Open Learning means to support and improve cooperation in education by the usage of technology. The modality or multimedia effect is a further advantage of computer- or technology-supported learning. It means that information is better stored and recalled, if it was double-coded and students perceived it through different media, like e.g. visual and auditory media (Low & Sweller 2005).

Mobile learning can be included in all of these three senses as a supporting and motivating device.

- For a lot of students Mobile learning is “cool” because they can use their own devices for learning.
- To improve Cooperative Open Learning mobile devices would be perfect because of the many different tools for communication and collaboration technology provides. Students can call each other, send messages and E-Mails or work together on one file at the same time but different locations.
- Mobile learning can today be seen as variation of Computer-supported Open Learning because most smartphones and tablet-PCs are very powerful and have similar functionalities like a PC or a notebook. Of course the mobile devices cannot replace PCs but they can be used to support learning by e.g. applying different media from the Internet.

3 IMPLEMENTING MOBILE LEARNING

The introduction of mobile learning in the vocational high school of commerce and tourism in St. Veit was accomplished in three steps and three subjects:

- A mobile learning workshop for students was offered in the voluntary subject “Learning to learn”.
- The use of mobile devices in COOL Spanish and Russian lessons was boosted.
- A creative school project on app programming was accomplished in Applied Informatics. It was funded by a regional program of the Austrian teaching support system IMST: “Teaching

Informatics creatively”.

3.1 School and Participants

The Vocational High School of Commerce and Tourism in St. Veit was chosen, because it offers education in subjects that are a good basis for COOL: “Applied information technology” and “Learning to learn”.

The school offers different branches of education, one branch for three years and two branches that lead to the qualification for university entrance (A-levels): Eco-Business (Environmental Studies) and International Management with three foreign languages (English, French, Italian), some classes with English as working language.

The students (totally about 500) are from 14 to 19 years old and can decide to learn up to six foreign languages. In addition to the obligatory languages they can choose Spanish, Russian and/or Slovenian. Besides that the students get an extensive instruction in economics, “Information and Office Management” as well as Applied Informatics.

Before introducing mobile learning we checked the technical equipment of the students by a preliminary survey (Sabitzer & Bischof, 2012).

About 75 % of the pupils own a smart phone with touchscreen, 40% of them with the operating system Android. The Internet is essential for mobile learning but fewer than 50 % of the students had contracts including more than 1 GB of data transfer and also only 55 % of the smartphones could connect with WI-FI. Before the workshop about 30 % already used it for school, mainly dictionaries.

3.2 The Introductory Workshop

The workshop about “Mobile Learning” was carried out in five groups of the voluntary subject “Lernen lernen” (Learning to learn), with about twelve students (14-16 years) each.

Each workshop lasted 90 minutes and was divided in two parts: The first part gave a short overview of the possibilities of mobile learning and in the second part the students had the possibility to try out the applications they were interested in.

In the overview we presented the following topics:

- General tools and applications, not only for mobile devices;
- Smartphone tools independent from the operating system, and
- Apps (applications) for the operating systems of Android and iOS (iPhone, iPad)

As general tools and applications, Google docs and Dropbox were introduced. These are two web-based file-storing systems for different purposes that allow jointly editing files and sharing them with others. In our school, all students have access to one common Google as well as one Dropbox account. This fosters collaborative learning independent from the classroom. In addition, the saved material can be used for other learning activities, not only on mobile devices.

After this introduction, the following smartphone tools independent from the operating system were presented:

- mp3-player for free audio-files in different languages, internet radio, etc.;
- voice recorder for registering the own learning contents e.g. vocabulary or dialogues;
- memo and sms, for taking notes and sharing them with others;
- video e.g. for presentations of different topics or dialogues for the development of an own language course, and
- websites (dictionaries, language courses like bbc.co.uk/languages etc.).

At the end, we presented some apps especially for the operating systems of Android and iOS (for iPhone) as well as for iPads, like language learning courses or the Leo-dictionary. Furthermore we showed different apps for flashcards, mindmaps and vocabulary trainers, which can certainly be used in all subject matters. The pupils seemed very interested and downloaded some apps immediately after the presentation.

In the second part of the workshop, the students formed small groups and tried out some different apps. All of them worked with their own smartphones and, additionally, each group could use one of the school's iPads.

After the workshop, the second questionnaire was given in order to evaluate the workshop itself and the presented applications. The results (details are described later) reveal that almost all students found the workshop useful and want to get a follow-up as soon as possible.

3.3 Mobile Language Learning

Besides the general workshop, the Spanish and Russian students had the possibility to put in practice what they had learned and to try out some new apps. Both languages are voluntary subjects of each two lessons per week and are held by the same teacher (one of the authors). These lessons have a special structure because of different reasons.

The first one is: they are bilingual. Spanish and Russian students (some of them learn both languages) study in the same classroom and the teacher permanently switches between the two languages. These groups are heterogeneous because the lessons are open for all students of the school. So language beginners learn together with advanced students, and, in both languages, all levels of the European Language Framework from A1 up to B2/C1 are represented.

These conditions cannot be managed by traditional teaching methods. The lessons require mainly self-organized learning with free work phases on a rotating basis. While Spanish learning students work on their own, supported on the one hand by advanced students and on the other hand by computers or mobile devices, the teacher can work with the Russian learning students and vice versa.

Another difficulty is the very dense timetable of the students. Sometimes they cannot attend the Spanish/Russian lessons because of other parallel events or courses at school (or because they have too many other things to learn), so it is necessary to integrate open and distance learning in both subjects. The use of the school's iPads and the pupils' own mobile phones allowed to implement some new and motivating learning tools that were presented in the workshop described above.

The Spanish/Russian lessons after the workshop were labor-intensive, but also fun. The students were highly motivated to try and use all the new applications they got to know in the workshop.

They worked in small groups, divided according to language and language level and started with free courses on the iPad. They tried the following three courses, available for Spanish as well as for Russian:

- 50languages, a free app for different mobile devices and operating systems, based on the corresponding online-courses with audio (Book2).
- Busuu, a language learning community for different languages, that offers some free lessons for each language level from A1 up to B2 as well as a tourist course (Busuu).
- Babbel, a multimedia language course, available online or via an app, that allows also to record the students' voice and to evaluate their pronunciation. (Babbel)

Based on these courses and using different multilingual dictionaries and verb conjugators on their own smartphones they wrote vocabulary lists and created mind-maps for some topics like animals, food, or time expressions. For the mind-maps they used the free apps Thinking Space (Android smartphones) and Simple Mind+ (iPad).

The vocabulary lists were typed in a Google table for two reasons: First, the school has one Google account where all pupils have the permission to save documents for learning. So they can work together on the same documents, independent from the classroom, and share their own work with others who are interested in.

The second reason is that these Google tables are the basis for two free learning apps for Android smartphones: Flashcards and a vocabulary trainer. Both apps work in the same way: the student selects one of the tables saved in Google (they are all listed in the app) and loads it on the phone. Once downloaded, the apps also work off-line without connection to the web.

Besides the different learning apps, the pupils enjoyed also the work with iPad videos. Some volunteers among the language beginners presented themselves in videos as a part of a digital curriculum vitae.

Observing the students' behavior and activities in these lessons, it seems that mobile learning is worth to be fostered because it increases motivation and offers a lot of possibilities. If it can enhance the learning outcomes, too, will be the question of a further study.

3.4 App-Programming in Informatics

The last step of implementing mobile devices in our school was the project "App-Programming with the App-Inventor" (Stadtman, 2013), carried out in a class of the 11th grade. The students had to create their own Smartphone Apps, which were tested and evaluated by younger pupils from a lower secondary partner-school. As none of the students had any programming knowledge the teachers decided to apply the App-Inventor from the MIT (Massachusetts Institute of Technology) (App-Inventor, 2013). With this software Apps for Android-devices can be created easily and without programming experiences. The code can be built out of predefined parts including some concepts of programming. So the students could get a first view of these concepts and, as preparation, learned how to format pictures so that they could be used in their Apps.

Like for every new tool and also for the App-Inventor an introduction for the students was necessary. This was accomplished by a short teacher presentation as well as some exercises and adequate solutions. After this short introduction phase the main part of the project started during which the students had to fulfill following steps:

- designing an own App,
- planning the working process,
- collecting or creating materials and
- using the App-Inventor to realize the Apps.

For both the students and the teachers it was a challenging situation because of missing previous knowledge. The students had to work a lot on their own and teachers tried to help and to overcome difficulties. At the end of the project each group had a running smartphone App and all of them were presented and evaluated in the "evaluation class". For the younger pupils it was very exciting to test the Apps and they were fascinated that the older students could produce such Apps on their own. The vocational school students got a very positive feedback, which proved that it was worth the effort and they could be proud of their own self-made products. During this project they went through a shortened software engineering process resulting in a mobile Application they could use on their own smartphones (Stadtman, 2013).

4 EVALUATION

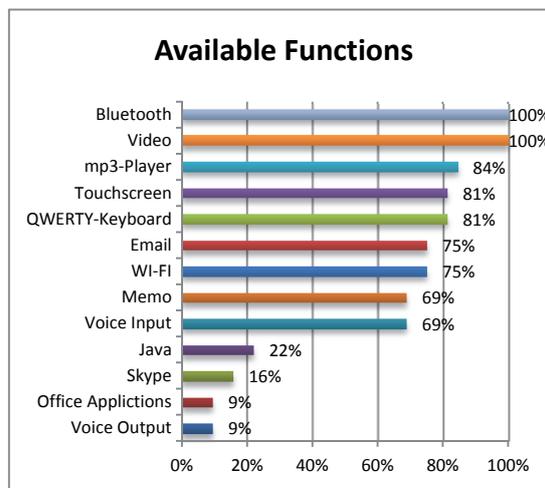


Figure 1: Functions available on mobile phones (n=32).

4.1 Introductory Workshop

The described workshop was evaluated by a questionnaire given to the participating students. 32 students completed the questionnaire.

Before the workshop most of the pupils rarely used the smartphones for learning and a third never used it. Another third of them sometimes used their mobile phones for school. Generally, the phones are well featured as shown in Figure 1. All students'

smartphones provide Bluetooth and Video and most of them use the mobile phone as mp3-Players (84%). As also voice input is mostly available (69%), the students' devices can perfectly support language lessons in the training of listening comprehension and speaking by following podcasts or creating own videos. E-Mail and Wireless LAN are available on 75% of the students' smartphones, which allows free online learning and/or search in the classroom by using the school WI-FI. The results show, that the implementation of mobile learning in different subjects is easily possible because of the students' equipment. Perhaps the school should provide some further mobile devices for students who don't have their own mobile phone or one providing only few functions.

After the workshop, the students were asked to evaluate how useful the different applications are for learning. They should give marks from very good (1) to insufficient (5).

A relatively clear decision of the students can be seen for the use of dictionaries, mind mapping, Office-Programs on the smartphone, Google docs, memos and notes, vocabulary trainer for Google docs, verbs conjugator and learning with own mp3-files. These applications were voted with very good or good by 50% or more students. The other applications are mostly assessed to be satisfactory. Table 1 shows the applications ranked by the rate of satisfaction (evaluated as very good or good).

Table 1: Ranked applications (n=31) and percentage of very good and good evaluation.

Application	%
Verb conjugator	74%
Memo and notes	74%
Dictionary	71%
Google Docs	61%
Mindmapping	58%
Learning with mp3 (own records)	55%
Vocabularytrainer for Google Docs	55%
Learning with SMS	55%
Office Software	52%
Flashcards for Google Docs	48%
Create flashcards for languages	48%
Create flashcards for other subjects	48%
Learning with provided mp3	45%
Encyclopedia, atlas, reference books etc.	45%
Formulary	42%
Dropbox	23%

Another important question was, which applications the students already used before participating in the workshop. Some students used the smartphone-applications for learning already

before the workshop. About 50% used memos and notes on the smartphone, but nobody used Office applications or Flashcards. The other functions were already used at least by a few of the students. Summarizing the results of the questionnaire as well as the informal feedback and the teachers' observation in the classroom it can be said that, among students, the acceptance of mobile learning and the level of contentment are high. Almost all students found the workshop useful and asked for a follow-up as soon as possible.

4.2 App-Programming

The evaluation of the project "App programming with the App Inventor" is still running, hence, at the moment only the feedback of the "programmers" - the students of the vocational school (eight girls) - is available. The most frequently mentioned answers to the three given questions are presented here (translated or summarized by the author):

- 1.) What did you like most in app programming?
 - I liked to try out all the Apps.
 - It was great that we could be creative and it was fun to fiddle about with the App Inventor. Further it was interesting to take a look at other Apps and to compare them with our own. It was interesting to see how much work it was to create our small Apps.
 - I liked to choose the pictures and sentences by myself, so I could be very creative.
 - The work with the App Inventor was difficult but I liked it very much to plan and create Apps self-reliantly.
- 2.) What didn't you like in app programming?

The students didn't like

 - that some errors, e.g. closing an App, could not be fixed.
 - that it took much time to adapt the apps and
 - it was exhausting and a bit annoying to type in all correct as well as all wrong solutions.
 - to put together all the needed parts in the App Inventor.
- 3.) Did you have problems in programming?
 - It was not possible to close the Apps.
 - It was easy to generate the Apps but it was complicated to put together all the steps in the Block-Editor because we had to fade out all the English answer-possibilities.
 - The buttons did not look like I wanted because they were on the wrong place. I was not able to make pictures appear and disappear at the right time. It was not possible

to create a break button and nobody could help me with this problem. Nothing worked as it should.

- It was difficult to program the buttons with the correct form and functioning.
- Our teacher could help me with every difficulty and all problems could be solved.

Further results - the evaluation of the apps by the students of the lower secondary school, interviews and teacher observations – will be presented in a further paper.

5 CONCLUSION AND OUTLOOK

Mobile learning is “cool” in the sense of motivating and fun. This is the core statement of the students’ feedback in the questionnaires as well as in informal interviews. The results show, that the implementation of mobile learning in different subjects is easily possible because the students’ smartphones are well featured. Perhaps the school should provide some more mobile devices for students who don’t have their own phones or one providing only few functions. But generally the students like cooperating (COOL as COoperative Open Learning) and working in pairs, which is very reasonable in language lessons, where communication is essential, as well as in Informatics, where this cooperation can be compared to pair-programming, an effective software engineering method.

The evaluation of the workshop shows that in spite of the well-equipped students, only few know how to use the applications or which applications can help them to learn. The students should be trained to use their phones in a useful way because mobile learning brings dangers with it, too, like viruses, radiation, or distraction (Dabon, Martin & Starner, 2004). As long as mobile learning is applied only rarely, the positive effect of increased motivation may prevail the risks. But what happens when it is applied in every lesson? Perhaps the novelty effect would disappear and the motivation would decrease. This has to be verified in a further study.

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