

## II. THEORETICAL AND METHODOLOGICAL ANALYSIS OF DISTANCE LEARNING

### BRINGING THE SCHOOL CLOSER TO THE REAL WORLD

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***Abstract:** "Mobile Chemistry" is the first textbook designed specifically for the tablets and other mobile devices. This is the textbook of the 21st century. It consists of interactive exercises which allow one to quickly check their knowledge. Instead of filling the gaps, or combining elements by drawing pencil lines, it is enough to drag items using hand or a stylus. It includes video clips depicting chemical experiences, explaining difficult issues, or showing otherwise unavailable effects in the school environment. Thanks to modern chemical sensors connected to the tablet PASCO students can perform an experiment by themselves. They help students develop their research skills, learn the analytical work as well as the principles of sampling and testing their composition.*

**Keywords:** mobile learning, e-books, multimedia, tablet, chemistry

### INTRODUCTION

On the Titanium Professional company's website, under the title "The first app in the history of the construction chemistry supporting partnership program", you can find the following information:

If only you have a smartphone / iPhone, the partnership program champions Titan mobile app can literally be used at any time. Even if you are not in the range of a wireless internet connection, you still have the opportunity to use some of app's functionalities. In contrast to the so-called mobile websites, with Champions Titan app the user is able to use it even without Internet access. For example you can

browse the prizes' catalogue, read the rules and principles of the program, check the contact details and a list of products covered by the program. (Press Releases 2013)

Could publishing houses involved in the development of textbooks boast with similar offer? On the publishing platforms we can find textbooks packages (unfortunately, usually based on flash technology, which is difficult to use on tablets), exercises (sometimes in an electronic form) and teacher guides (often available online only). Colorful covers lure us with its graphic charm, virtual laboratories encourage to undertake experimental actions and Internet materials inspire independent knowledge and skills testing. Much has been done and many things has been offered to schools and teachers. Time flies and the approach to ways and means of education is changing. And here we are, at a time when colorful exercise books' covers, collections of assignments and tests disappear sequentially from publishing houses' websites, and CD icons, which encouraged to browse CDs full of videos, animations, dynamic models, infographs and educational games are removed from textbooks. Impatiently we are anticipating what is going to appear instead. Textbooks divested of any extras and e-books rich in innovative multimedia solutions or manuals in PDF format for tablets?

At the same time, the American publisher of school textbooks have signed an agreement with ScrollMotion, which is preparing fully interactive, iPad versions of their books. You can search through its texts, check the meaning of a word in a dictionary, browse the galleries illustration or move to the selected pages. It is also possible to play interactive video, text selection, read the text using a speech synthesizer and add notes. Textbooks' publishers see their chance in the iPad (Komputer. World 2014).

Apple introduced a platform for schools containing paid versions of the manuals (in English) and a free application to create them. Interactive, allowing an attractive presentation of the content, textbooks look like they belong to the school of the future, and iBooks Author is considered to be the best tool for teachers since the invention of a textbook. Manuals in iBooks 2 are fully interactive. They have a unified, simple navigation, the content can be easily searched and highlighted and it is possible to take notes and a placement test at the end of chapters. A student may use them in vertical and horizontal mode, and in the vertical mode text will be of more importance and in the horizontal mode - additional materials (Spider'sWeb 2012).

Considering the above, have the new ways to equip tablets present in Polish schools in adapted to them and readily available high-quality books been marked?

## **1. TEXTBOOK ON TABLETS**

Looking for new educational solutions in the technology world, more and more Polish schools accede to the "Textbooks on the Tablet" program As part of this project in 2012, 19 junior high schools in Poland replaced paper manuals with tablet

devices on which application that contains a set of textbooks was installed. Tablets belong to the students - the project is funded by their parents, or in some cases by the local government. In the program public, private and social schools take part. At the very beginning the project required great courage of principals and teachers, but the effort invested the school's preparation for such work repay with students' and parents' growing interest. Participation in the project is voluntary - choice of electronic or paper version of textbook belongs to the parents and students. The cost of electronic textbooks is similar to their paper counterparts. The textbook application can be installed on a device that student owns or on a device purchased in the project. Tablet purchased in the Project remain student's property. (Multiedukacja 2013).

One of the enthusiasts of mobile education, Dariusz Stachecki, writes: Middle School in New Tomyśl develops its own program "Education of the iPad" for the third year. This year we provided another class called "E-class" with iPads mini. Therefore, every day 75 students work in class iPad in the 1:1 system. In addition, we launched a mobile iPad classroom, consisting of 12 units, which is willingly picked up for lessons in all subjects in other classes. As a result, while using the state-of-the-art technology, students can actively participate in interactive lessons. Although we use 19 interactive whiteboards, iPads give each student or a pair of students a chance have their own board, which performs exercises and tasks prepared by teachers using the application, e-books, movies, etc. It definitely increases the pace and dynamics of lessons, makes them more attractive, and student work becomes more efficient and exciting. A new and very important part of the equipping another group of teachers with iPads. Providing each teacher with company iPad allows them to conduct effective and interesting lessons. (Stachecki 2013).

What is actually a mobile device? It can be described as a case of digital tools, which we always have with us. As a result, students can have unlimited access to information resources and teaching aids that they created themselves. According to prof. Elliot Soloway of the University of Michigan (lektor.pl 2012), mobile software developer, mobile teaching:

- creates the possibility to learn at anytime and anywhere;
- has developmental character because the majority of students already owns a cell phone or other more advanced tool and school has to invests only in the software. Another challenge is to create a plan to introduce a mobile education program in curriculum;
- is unique, because it created a completely new possibilities for communication using blogs and communicators.

The technical possibilities, however, are only one aspect of the development of mobile learning. Worthwhile is asking yourself the key question - what exactly school exists for? So far, repeatedly used answer stated that it is an institution

transmitting information to students, but as times have changed, and students develop their knowledge using the Internet and many other sources. What role, then, plays the modern school? Instead of providing information, it should provide students the opportunity to participate in collaborative tasks, in which information is only the basis, not the aim (eSchoolNews 2014).

## 2. MOBILE CHEMISTRY TEXTBOOK

Intended for middle school students Mobile Chemistry textbook is one of the manual created for mobile devices such as tablets (Gulinska, Bartoszewicz 2014). The manual has been developed for the functionalities of mobile devices, so it is not an electronic version (in PDF format) of the printed manual and it does not refer to traditional solutions, but creates new opportunities for student's interaction in the teaching-learning process. Among many proposals, those listed below deserve special attention:

- wide range of well-illustrated experiments,
- proposals of experiments that can be safely conducted at home,
- films with film tasks, animations and radio broadcasts,
- summaries in the form of infographs, diagram and tables
- educational games, virtual lab project proposals;
- interactive student tasks and mock exam tests.

The textbook refers to the standards of media and Internet information. It enchants its recipient, it draws attention with colourful pictures, interesting news and info graphs which allow to see what remain unseen at first sight. It departs from the linear narrative, in favour of a visual medium, attracting the reader by rich graphical structure, photographs, coloured headings, varied typography and a relatively small amount of a uniformed text. This change is due to the appreciation of visual communication in general and changes in the field of education and psychopedagogy (Gulinska 2014).

Posted in the every topical section of Mobile chemistry textbook proposals the experiences using PASCO sensors will provide teachers with valuable examples of actions with appliance of the package of sensors. Described science and research allow measurements both in stationary conditions on the lessons in the classroom as well as during outdoor activities.

Each of the twelve topical sections includes modules (with a summary of lessons) and summary of knowledge.

### **Activities available in each module (lesson with summary):**

- hypertexts, which after pointing at them shows additional material enriched with photos and illustrations, timelines and tables, which are

- valuable supplements to students knowledge through the creation of visual connotations;
- variety - additional information illustrated with photos, views or diagrams;
  - movie sequences - showing the course of the experiment;
  - interactive tasks and exercises allowing to check the answers.

**Activities of the *What have you learned* part:**





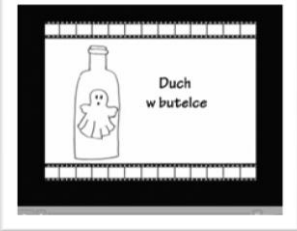







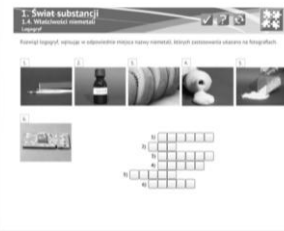

- home laboratory enriched with photo story - describes the experience which can be conducted at home (in the description observations and conclusions are presented);
- exercises allowing to verify the chosen solution;
- film tasks - related to topics of the movies presented in each lesson;
- Radio ChemFM - solving tasks after listening to the news;
- magic numbers - interesting, unusual data presented in tables and graphs;
- our hero – information about the life of an exceptional person related theme of the lesson;

summary in the poem - the most important information included in a poem.

**Activities of the *This you have already known* part:**

- film tasks – filling the gaps in the text after watching the film without commentary
- info graphs associated with the topic;
- tasks based on info graphs
- middle school test - existing database is going to be successively broaden
- educational games including creating picture relations based on associations;
- experience set using sensors PASCO – tasks proposed in textbook are always connected to the part topical part, helping develop students' research skills, teach analytical work, rules of taking samples and examining its composition.

Thanks to the applied technology, students can learn in the most effective way and at their own pace. Interactive way of working allow to adjust the level of difficulty to their capabilities, giving them more or less challenging tasks, depending on their degree of subject's mastery. The difficulty of the material is gradually adjusted to the degree of competence's acquisition, thus avoiding the backlog in the study.

		
<p><b>Film tasks</b></p>	<p><b>exercises</b></p>	<p><b>tasks based on infographs</b></p>
		
		
<p><b>movie experiments</b></p>	<p><b>lesson modules</b></p>	<p><b>funfacts</b></p>
		
		
		
<p><b>home laboratory</b></p>	<p><b>tasks, games, charades</b></p>	<p><b>exercises</b></p>

**Figure 1. Elements of Mobile chemistry textbook**

*Source: Author's archive*

### 3. MOBILE LEARNING STRATEGY

It was assumed that working with Mobile Chemistry textbook will be realized on the basis of MASTER learning model developed and tested by John Hattie from the University of Melbourne. MASTER is an acronym for six steps to effective learning: Motivation, Active facts assimilation, Seeking the matter, Training memory, Examining oneself, Reflection.

Method's author performed a meta-analysis of over 500 scientific studies on the effectiveness of different learning strategies, conducted on a group of 200 million students. On this basis, he developed a list of the 10 most effective strategies and learning techniques. All of these can be implemented using digital tools - tablets, computers, interactive whiteboards and educational platform. Thanks to this studies individualized learning proposal becomes feasible (Institute of Modern Education, 2013).

Research on the Mobile chemistry textbook educational effectiveness was launched in June 2014. It is too early then to even talk about specific results. In-depth research on the possibilities of popularization of textbooks for mobile devices will continue in the school year 2014/2015 in selected secondary schools throughout the country. One of the first lessons of this kind was attended by first grade students from 60th Middle School in Poznan.



**Figure 2. Students attending middle school in Poznan during the lesson manual**

*Source: Author's archive*

The method of work proposed by the teacher met with interest, and even applause from students who intuitively recognize the functions of each textbook's icon and eagerly joined the actions proposed to them - independently planned and performed experiments and documented its course in the form of videos and photos, individually and collectively solved tasks, exercises and took tests.

Scheduled learning process management systems and online exercises allowed students to quickly verify the progress of each student based on the criteria given to students in advance. Learning at student's own pace meant that the most talented students did not get bored, and those with difficulties got extra time and

support. This method of teaching directly involved students in their own education, using technology and activities which they like.

Surveyed students suggested that they would like to use mobile devices more frequently during their education process. They have a fairly free access to mobile devices and treat the presence of a computer in their pockets as granted, and thus they see the importance of a role that it play in their education. Youth would also like to work on specific projects both at school and at home, as well as play educational games. Besides, they expressed their willingness to use mobile technology to browse the Internet resources, recording lessons and listen to them during their free time. They would also like to receive notifications about homework and quizzes, access the school website and manage some administrative issues in the Internet.

Preliminary results of research conducted by the authors of the Mobile Chemistry textbook are successively transferred to teachers during workshops and conferences. In June 2014 chemistry teachers already had the opportunity to read the textbook and express their opinions on its structure and the possibility of interactive work with students. Subject of workshop: "Chemist – an artist and a mobile teacher" and the opportunity to work with a Mobile Chemistry textbook for iPads met the interest of teachers, what resulted in planning a joint research in the following school year (Gulinska, Bartoszewicz, Krzyśko 2014).



**Figure 3. The teachers of chemistry and science at a workshop conducted as part of the 16th School of Chemistry Teaching Problems**

*Source: Author's archive*

The research's results and students' and teachers' feedback as well as the enthusiasm of all those involved in the chemistry class using the tablet, are consistent with the results presented by the Organization of Project Tomorrow, which conducts research project on the use of modern technology in the school among American students for many years. Recently published results of the subsequent stage of research. They show that young people primarily expect from the school a greater access to mobile tools and a wider range of online courses. Analysis of the submitted questionnaires showed that students are a group



very much involved in digital education. They adapt to new technology and create new ways to use it (Andrzejczak 2009).

According to one third of the surveyed graduates, classes conducted in the network are easier to pass, as they allow their participants to ask questions and recall the material contained on the website as many times as they need.

Researchers from Project Tomorrow also gathered students' ideas on how to create the perfect digital textbook. For many of them, the mere prospect of using the paper guide is repulsive and archaic. Youth would like to be able to fit the textbook to their individual needs, eg by applying underlining or adding notes. They would be happy to use specialist's in a particular field help, who could respond to their concerns online, even after school hours.

Both students and parents highly appreciate careers in such fields as natural sciences. Students would like to learn more about career opportunities related to these development trends, especially through meetings with the employees of these industries, apprenticeships, video presentations and movies available on the web. Valuable experience could also be gained by using authentic tools and solving real problems (Andrzejczak 2009).

At the time when Poland is debating over the purchase of laptops for students, and the media ramble on the dangers lurking on the Internet, Americans have already organized the first conferences on the role of mobile learning. Smartphones and other mobile devices became a thing common enough in the student's backpacks that their use in education seems to be a natural consequence. At the same time, in order to consider it as another tool used in education, comprehensive methodological concept of how to adapt modern technology to the school must be created, to get the most out of its benefits. Conference speakers discussed how such methods of work help students achieve better scores in competence tests and improve their skills. Students asked about what would they like to have the most, answer: a laptop / an iPad. The reason is not the uniqueness of these devices, but control over their own knowledge, which they gives them. Similar opportunities are given by a new generation of phones that are much cheaper. Students can use them freely - when and where they want, as if they got reduced in size laptops which fit in the pocket. And importantly, mobile devices are very personalized.

Research conducted in North Carolina have shown that due to the use of smartphones students' math scores improved by 20%. This project, named K-NECT, was started in the school year 2007/2008. Its goal was to improve the mathematical skills of students in ninth grade (in Poland it is 2nd grade of middle school) who did not have access to the Internet at home or it was impeded, came from poor families and the level of mathematical knowledge stood out from their peers. Chosen students receive smart phones with special software and wireless Internet access available at school and at home. This enabled them to use the materials related to lesson's topic and purpose as well as virtual assistants' help if they had trouble understanding the content. The project, which is part of a global initiative to

popularize wireless education, assumed (except for educational purposes) included creating equal educational opportunities for young people coming from difficult backgrounds. Most of the teachers who had the opportunity to work with this method highly valued the fact that this method not only helps improving academic performance, but also develops students' communication skills, which can then be used in the classroom.

## CONCLUSION

Teaching with the help of digital textbooks and electronic resources on mobile devices is certainly not free of difficulties that need to be overcome during the wider implementation. First of all, not all the teachers are suited to work using this method. It requires considerable knowledge of how to incorporate science assisted mobile devices to the general curriculum.

The opinion on the potential problems stated Keith Krueger, the head of the Consortium for School Networking: "We often say that technology will solve all the problems in our schools and it is the reason why it ends in failure. (...) You cannot introduce technology into schools, and then build its limitations. It cannot be introduced without knowing what means should be realized. What skills students should possess? How painlessly turn technology into the curriculum? Mobile devices will not solve the school's problems, but may become an inspired help in developing students' creativity. "Research is already underway, pilot schemes are financed. It's not just a fad - it's the future!" ([www.eschoolnews.com](http://www.eschoolnews.com))

Thinking about introducing new technology to the school we also have to keep in mind negative evaluations, such as: using the textbook on the iPad in most cases will remind struggling with learning or reading a long text on the computer screen. This problem was described a year ago by Nicholas Carr in his famous book "The Shallows. What The Internet Is Doing To Our Brains. "He cited in the study Anne Mangen, Professor Norwegian University of Stavenger, which proves the existence of the relationship between the understanding of the text, as set out in the links. In short, every link and clickable, interactive element included in the text, reduces the chances of its understanding (Boguszewicz 2012, Carr 2011).

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