

## The Role of Mobile Technology in Supporting the Learning Process of Adults in the 'Network Society'

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### Abstract

*The Internet has changed the perception of the world and influenced many areas of human social activity. Today's society is called 'information society', 'knowledge society' and but also 'network society'. The development of the media and new technologies has caused that today's teacher and student of all ages can enjoy a variety of tools to improve communication, gathering information and learning. The author in an article describes and analyzes the example of mobile technology tools used in the learning process of adults. The research was conducted in Poland by the experiment on a group of 72 students of pedagogy. The presentation focuses on the IT applications Q MINDshare™ as an innovative educational tool. This utility has been used thus far in the field of business and during the research has been applied to education. It facilitates learning and memory through repetition of small portions of knowledge at different time intervals. It is based on the idea of spaced learning. As a complement to the paper the author presents the reflections on the phenomenon of network society in the context of Polish reality.*

**Keywords:** new technology, education, ICT tool, 'network society', learning

### 1. Introduction

The disposition towards creating, maintaining and existing with a society of groups and communities is characteristic of humankind; we are social animals (Aronson, 2003). At the same time, people are still redefining and describing new social environments in which they participate. These changes apply to all of us and are also an object of interest for many social and humanistic sciences. J. Bierówka (2009) describes an incompatibility in the discourse of the purpose and character of society: According to A. Giddens (2001) & U. Beck (1986), we still live in an industrial society (for: Bierówka, 2009). Others, for example Z. Bauman (2000), F. Fukuyama (2000), R. Inglehard (1997), and A. Toffler (1997) claim that since the 1960's, society has gained features which are not associated with industrial society (for: Bierówka, 2009). The plurality of the changes concern different spheres of human functionality. In this article, I will focus mainly on the development of communication and information technology. Transformations of the media and development in teleinformatics influenced the metamorphosis of relations between people and the creation of social structures. 'Modern reality', a theoretical model or concept, which we often refer to, is being analyzed and called the 'Information Society' (Bierówka, 2009). Sometimes the term 'Knowledge Society' is used, or the 'Network Society'. The conception of the Network Society had been spread by M. Castells' publications, in which he spoke of a new social structure based on modern communication and information technologies and microelectronics (Kollányi, Molnár, Székely 2007). The process of communication has changed, which is especially visible following the development of media and media instruments. Castells (2006, for: Kollányi, et al.2007) stressed the global and at the same time local, character of the media, digitalism and interactivity of communication channels and also the possibility to create and distribute contents by the users themselves (blogs, vlogs, podcasts, etc.)

We can currently observe an increase in the popularity of social media and the so called 'Web Revolution' became real. Today, the content is created collectively; information has to be transmitted immediately, and the modern user of the media – especially of the internet – would like to be on-line all the time. Indeed media devices and technological novelties are increasingly mobile and versatile. Communication and cooperation is accessible 24/7 (Solomon, Schrum, 2007).

The changing reality is a new field of action for education, and a challenge for practitioners of, and theoreticians associated with, the area of education. It is not without reason that people talk about the 'Knowledge-based Society' (e.g. Juszczuk, 2012). The concept of learning for one's entire life without regard for sex, age or social status is dynamically developing. An increasing number of people in Poland decide to continue their education at university, but they also

continue learning after their formal education has ended, whether in courses, workshops or postgraduate studies. Different forms of self-improvement are increasingly used. Education can be conducted in the traditional model of face-to-face interaction between tutor/lecturer/trainer and the student. In that case, the education is stationary and takes place in a classroom or training room. However, mobile courses are becoming increasingly popular. They use e-learning platforms, in which the contact between the teacher and student is much more limited. In some cases, both these models are used, which is effective. In blended learning, the traditional process of learning is strengthened by mobile forms, modern multimedia tools and a modern approach to education as a process of creation, transference and modification of the educational content by the student themselves. In that case, social media, such as social networking, blogs, podcasts, on-line games, the wikis, which enable the student to learn through participation, is of growing importance (Frانيا, 2012).

The theory of connectivism, popularized by G. Siemens (2005), is progressively becoming popular. It is sometimes called a modern theory of learning in a digital world. Its author described current trends associated with education:

- Many learners will move into a variety of different, possibly unrelated fields over the course of their lifetime.
- Informal learning is a significant aspect of our learning experience. Formal education no longer comprises the majority of our learning. Learning now occurs in a variety of ways – through communities of practice, personal networks, and through completion of work-related tasks.
- Learning is a continual process, lasting for a lifetime. Learning and work related activities are no longer separate. In many situations, they are the same.
- Technology is altering (rewiring) our brains. The tools we use define and shape our thinking.
- The organization and the individual are both learning organisms. Increased attention to knowledge management highlights the need for a theory that attempts to explain the link between individual and organizational learning.
- Many of the processes previously handled by learning theories (especially in cognitive information processing) can now be off-loaded to, or supported by, technology.
- Know-how and know-what is being supplemented with know-where (the understanding of where to find knowledge needed) (Siemens, 2005).

Knowledge is not a complete portion of information, it is rather a form of communication; a way of forming networks and connections. This statement is a basis for the network-based pedagogy. MOOC (massive open online course) is a typical example where the users can learn from one another, by creating their own educational content. It provides traditional and modern sources of information and creates an enormous society of learners and scholars. Participants from all over the world often have free access to cooperate, gain experience and create their own content.

Mobile learning plays an important role in such a developing, technological and educational environment. Learning, improving memory, and developing skills with the help of such mobile devices as laptops, mobile phones, smart phones, tablets etc. is a dynamically growing phenomenon. They became another instrument which can be used in a modern process of learning. They can become one of many teaching aids, or the main element of the learning process. The modern educator is not only a teacher. They are also an educationalist and creator of content that is available to access from mobiles devices in a way that is student-friendly and appropriate for all ages.

The rapidly growing market of mobile devices and software is a pretext for the use of new technology in school and privately. I conducted my own research which concerns new media-communication solutions used in learning according to unity students' needs. The results of this scientific exploration, its analysis and my reflection upon it that are presented below, are selected parts of a bigger project planned for 2012-2014, at the University of Silesia in Katowice, Poland.

## 2. Methodological context of research

The aim of the presented part of research was to verify whether the communication and education device Q MINDshare<sup>TM</sup>1 is effective in maintaining the knowledge related to ICT, elements of media and media education acquired by the students during stationary classes. The assumption was to present the relation, or a lack of, between repetitions of the material using Q and the level of knowledge about the subject after the course.

The process was focused on the main problem and the following research question was posited:

*“Does using Q MINDshare<sup>TM</sup> mobile application influence the level of knowledge and the amount of memorised*

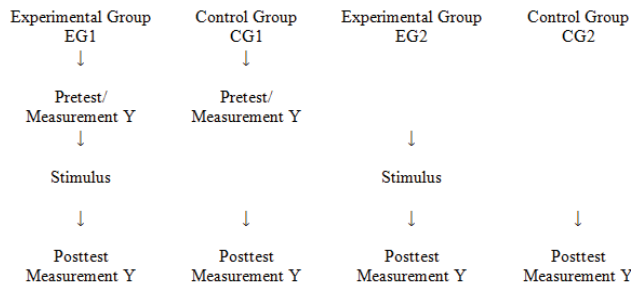
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<sup>1</sup> The full name of 'Q MINDshare<sup>TM</sup>' and its abbreviated form, Q, in this article are used interchangeably and have equal meaning.

*information contained in the course programme of a given subject among pedagogy students and what influence does it have?"*

The dependent variable Y, as specified by A. W. Maszke (2004) was the subject of this research. This variable defines direct or indirect results of interactions between independent variables, occurrences that are being examined by the researchers and the values which the researcher is looking for. In the case of the author's own research, it was the level of knowledge defined by the information test. The main independent variable, X, was the use of the application Q.

The research was experimental and the pedagogical experiment was designed and conducted by me, according to Solomon's four-group plan, which is considered to be the best of the so called "0-1" plans (Brzeziński, 2004). It allows for the control of the results of the pre-test without the necessity to give up an initial measurement. It is believed to be somewhat difficult to put into practice but, at the same time, it has a great cognitive value.



As a part of the experiment, by means of a knowledge test, I measured the dependent variable at a pre-test stage in the experimental group EG1 and the control group CG1. The test consisted of 20 questions of varied nature. Each answer could earn two, one or zero points. The student could get 40 points in total. Then two experimental groups EG1 and EG2 used the Q application in the course of one semester. All of the students were participating in a regular, stationary study programme. People who were randomly assigned to supervisory groups were not obliged to use additional programmes, tools or applications. Learning and memorizing the content in after-school activities was beyond the teacher's control, and the type of activity, or lack thereof, was entirely the choice of the student. Members of the experimental groups were obliged to use the Q MINDshare™ application on their personal computers or other mobile devices. It is an interactive education and communication tool which allows for many possibilities of use. One such possibility is the revision of material learned earlier according to the idea of spaced learning. The material was revised in intervals of time such as to enable students to absorb the information and not forget it, as in the case with a single presentation of information (Wick, Pollock, Jefferson, 2010). Participants of the experiment received a packet of two questions / tasks twice a week during one semester. The material learned earlier during the classes had been divided into parts and reformulated into: single-choice questions, multiple-choice questions, adjustments, ranking, gap filling and other questions. The question was automatically shown on the mobile device's screen. The student didn't have to remember to check the inbox regularly or log in the platform. When the task had been accomplished, the student was given access to short, educational material (feedback), e.g. a text, reference to web page or book, material, video, etc. The progress of the group – both individually and as a whole – was being observed and recorded. A student who gave the wrong answer to a question was given two more chances. After a scheduled period of time, the task was provided again. After the end of the semester the students of all groups: EG1, EG2, CG1, CG2 sat the post-test in which – by means of the same device that was used in the pre-test - the level of knowledge in a given field was measured. 72 full-time students in the first year of pedagogy at the University of Silesia, in Katowice, took part in the experiment. The sample was randomly divided into equal experimental groups: (EG1, EG2) and control groups: (CG1, CG2).

### 3. Results and Discussion

In social science, null hypotheses (H<sub>0</sub>) are frequently tested in order to enable the assessment of a given variable. This test is a type of inductive statistical reasoning in which the research hypothesis is not tested directly, but the opposite assumption, the null hypothesis, is considered first. While making the null hypothesis, we assume that the independent variable does not influence the dependent variable; therefore there are no differences between the groups. Subsequently, with reference to probability theory, the H<sub>0</sub> probability is estimated. If it is small, the null hypothesis is

rejected in favour of an alternative hypothesis,  $H_1$ , which states that differences between the groups exist (Bedyńska, Brzezicka, 2007). For this research, the following working hypotheses were formulated:

$H_0$  The use of the mobile application, Q, by students has no impact on the level of knowledge and memorised information related to the curriculum within a given subject.

$H_1$  The use of the mobile application, Q, by students has an impact on the level of knowledge and memorised information related to the curriculum within a given subject.

Statistical orders that concern Solomon's experimental four-group plan predict two ways of conducting an analysis of the obtained results: basic analysis and additional, advanced analysis that takes into consideration multi-dimensional statistical models such as: variance analysis, contra variance analysis and multiple regression analysis (Brzeziński, 2010). For the purpose of analysing my own research results, I decided to use the basic analysis of data that I supplemented with the ANOVA variance analysis conducted in Statistica software. The traditional analysis required the following comparisons in order to confirm the research hypothesis (see: Brzeziński, 2010):

$$Y_{1k} > Y_{2k} \quad Y_{3k} > Y_{4k} \quad Y_{1p} = Y_{2p}$$

$$D_1 > D_2, \quad \text{where } D_1 = Y_{1k} - Y_{1p}, \quad D_2 = Y_{2k} - Y_{2p}$$

Y – The dependent variable

Yp – The initial measurement (pre-test) of the dependent variable Y before the media education classes. Next to the symbol, p, the following specification of a given group will be found:

1 is EG1; 2 is CG1; 3 is EG2; 4 is CG2

Yk – The final measurement (post-test) of the dependent variable Y after the introduction of classes on media education; next to the symbol, k, the following specification of the group will be found:

1 is EG1; 2 is CG1; 3 is EG2; 4 is CG2

Because of the non-directional character of the hypotheses in the research, the sign ">" had been replaced by  $\neq$  (Brzeziński 2010). I presented the individual scores achieved by students in the pre-test (EG1 and CG1) and the post-test (EG1, EG2, CG1, CG2). It is worth noting that all students who had taken part in both the pre-test and the post-test achieved more scores at the end, which can be interpreted as an increase of knowledge. The group that was using the mobile technology tool to strengthen memorizing displayed a much higher increase in the level of knowledge.

**Table 1.** Points achieved by the students in the initial and final test of knowledge ( $N_{EG1}=18$ ,  $N_{EG2}=18$ ,  $N_{CG1}=18$ ,  $N_{CG2}=18$ )

EG1	Pretest	Posttest	EG2	Posttest
Pedagogy, Student 2012/1	5	33	Pedagogy, Student 2012/2	28
Pedagogy, Student 2012/4	13	36	Pedagogy, Student 2012/3	29
Pedagogy, Student 2012/5	8	34	Pedagogy, Student 2012/15	39
Pedagogy, Student 2012/6	6	29	Pedagogy, Student 2012/16	32
Pedagogy, Student 2012/7	20	28	Pedagogy, Student 2012/17	21
Pedagogy, Student 2012/8	3	21	Pedagogy, Student 2012/18	33
Pedagogy, Student 2012/9	5	28	Pedagogy, Student 2012/19	27
Pedagogy, Student 2012/10	8	34	Pedagogy, Student 2012/20	30
Pedagogy, Student 2012/11	8	19	Pedagogy, Student 2012/21	30
Pedagogy, Student 2012/12	4	20	Pedagogy, Student 2012/22	34
Pedagogy, Student 2012/13	10	34	Pedagogy, Student 2012/23	19
Pedagogy, Student 2012/14	6	30	Pedagogy, Student 2012/24	28
Pedagogy, Student 2012/28	11	29	Pedagogy, Student 2012/25	23
Pedagogy, Student 2012/30	12	30	Pedagogy, Student 2012/26	34
Pedagogy, Student 2012/31	5	35	Pedagogy, Student 2012/27	17
Pedagogy, Student 2012/32	11	14	Pedagogy, Student 2012/29	31
Pedagogy, Student 2012/33	5	21	Pedagogy, Student 2012/35	28
Pedagogy, Student 2012/34	5	19	Pedagogy, Student 2012/36	17
CG1	Pretest	Posttest	CG2	Posttest
Pedagogy, Student 2012/37	6	16	Pedagogy, Student 2012/55	17
Pedagogy, Student 2012/38	10	15	Pedagogy, Student 2012/56	18
Pedagogy, Student 2012/39	9	13	Pedagogy, Student 2012/57	22
Pedagogy, Student 2012/40	6	10	Pedagogy, Student 2012/58	17
Pedagogy, Student 2012/41	11	20	Pedagogy, Student 2012/59	11

Pedagogy, Student 2012/42	7	12	Pedagogy, Student 2012/60	15
Pedagogy, Student 2012/43	10	22	Pedagogy, Student 2012/61	20
Pedagogy, Student 2012/44	6	9	Pedagogy, Student 2012/62	22
Pedagogy, Student 2012/45	8	13	Pedagogy, Student 2012/63	12
Pedagogy, Student 2012/46	5	6	Pedagogy, Student 2012/64	18
Pedagogy, Student 2012/47	10	11	Pedagogy, Student 2012/65	9
Pedagogy, Student 2012/48	6	10	Pedagogy, Student 2012/66	19
Pedagogy, Student 2012/49	16	17	Pedagogy, Student 2012/67	24
Pedagogy, Student 2012/50	8	18	Pedagogy, Student 2012/68	9
Pedagogy, Student 2012/51	7	19	Pedagogy, Student 2012/69	11
Pedagogy, Student 2012/52	8	13	Pedagogy, Student 2012/70	15
Pedagogy, Student 2012/53	6	16	Pedagogy, Student 2012/71	21
Pedagogy, Student 2012/54	4	15	Pedagogy, Student 2012/72	22

Source: Own research

In the traditional analysis recommended in the four-group experimental plan, all groups had been compared. Each group consisted of 18 members and it was possible to achieve together 720 points in every stage. In the initial measurement, EG1 achieved 145 points and CG1 achieved 143 points. In the post-test, EG1 achieved 494 points; EG2 - 500 points; CG1 - 255 points and CG2 - 302 points.

494 > 255 => condition  $Y_{1k} \neq Y_{2k}$  is met

500 > 302 => condition  $Y_{3k} \neq Y_{4k}$  is met

145  $\neq$  143 – the result is not equal, but the disagreement is not statistically significant

349 > 112 => condition  $D_1 \neq D_2$ , where  $D_1 = Y_{1k} - Y_{1p}$ ,  $D_2 = Y_{2k} - Y_{2p}$  is met

Similar calculations and reasoning can be performed with reference to the average points obtained in particular groups.

According to basic analysis, the use of the mobile technology tool has an impact on the level of memorized information. Furthermore, it is associated with an increase of knowledge.

Nevertheless it is necessary to control the pre-test effect as it may signify that people who undergo the initial measurement, to a certain extent, become more "sensitive" and learn how to answer the questions during the final measurement. In this case, the condition of inspecting the pre-test had not been met:

494  $\neq$  500 and 255  $\neq$  303.

However; the differences are relatively small. The F-ANOVA test may indicate not only the real significance of the pre-test, but also the variable, X, and the interactions between X with the pre-test Y. Table 2 presents the results obtained.

Table 2. The results of the test F-ANOVA

Effect	One-dimensional test of significance for the result of the test of knowledge Parameterization with sigma-restrictions Decomposition of the effective hypothesis				
	SS	Stages	MS	F	P
Absolute term	33411,13	1	33411,13	1080,255	0,000000
Experimental factor - using Q	2652,35	1	2652,35	85,756	0,000000
Pre-test	39,01	1	39,01	1,261	0,265335
Experimental factor - using Q* Pre-test	23,35	1	23,35	0,755	0,387996

Source: Own research, Statistica software calculation

In conclusion, the influence of the pre-test was not significant enough from a statistical point of view, which confirms that the respondents were not in any way sensitised towards the tasks included in the test during the initial measurement. Similarly, the interaction of the pre-test and the experimental factor had little significance for X. However, the experimental factor itself proved highly significant in this case. Hence, the working null hypothesis saying that 'using the Q device does not influence the level of knowledge and memorised information' can be rejected. It can be inferred from the results that the students who revised, by means of the application, memorised a significantly bigger amount of new

material than those who did not use it.

Table 3 presents the average points achieved by each group taking part in the experiment depending on the participation in initial measurement and the kind of the group they had been assigned to.

**Table 3.** Average points achieved by each experimental and control group in pre-test and post-test

In general		N	average
With the use of Q		72	21,54167
Without the use of Q		36	27,61111
The group with the pre-test		36	15,47222
The group without the pre-test		36	20,80556
With the use of Q	The group with the pre-test	18	22,27778
With the use of Q	The group without the pre-test	18	27,44444
Without the use of Q	The group with the pre-test	18	27,77778
Without the use of Q	The group without the pre-test	18	14,16667
Without the use of Q	The group without the pre-test	18	16,77778

**Source:** Own research, Statistica software calculation

#### 4. Conclusion

The research confirmed the effectiveness of the Q MINDshare™ device, used by the students as a tool for additional revision of material learnt in classes. Questions and tasks in Q helped to increase the level of memorised information and to broaden their knowledge. The effectiveness of this device in the research group should be evaluated positively.

It should be noted that the application was not a separate and independent form of learning. In the assumed model of research, it was combined with the traditional classes. In my subsequent planned analyses, I will try to indicate which element (e.g. revision of small amounts of material; quizzes and competitions, mobile learning style, etc.) associated with technology particularly influenced the effectiveness of the learning process.

Undoubtedly, in the face of the emerging network society, devices of this kind are a great help. Nevertheless, they also change contemporary education. A. Kukulska-Hulme and J. Traxler (2005) list the types of functionality of mobile devices such as: phones, video, cameras, organisers, the web, e-mail, games, e-books, movie players, GPS compasses, music mp3s, etc. The variety and availability of options creates new possibilities of education. The process of learning is subject to time and organisational changes. The master-student relationship undergoes a metamorphosis. The system of assessment and verification of students' or pupils' progress should be modified. It is a challenge for the future – a task for the emerging network society.

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