

Can we Fight Social Media with Multimedia Learning Systems?

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Abstract - The latest information technologies enabled the world to become a place with more and more easily accessible information. Immense quantities of information are exchanged on a daily basis using contemporary communication technologies, especially by the means of social media, but are we becoming more knowledgeable? The latest reports (World Bank report and PISA testing results) reveal that high school students from Macedonia showed degrading results concerning knowledge. Internet statistics about social media usage and the survey we have conducted show that high school students in Macedonia extensively use social media and find multimedia learning quite helpful, but rarely use computerized learning systems in classes. The purpose of this research is to search for an opportunity to partly divert students from social media usage to spend time on Multimedia Learning Systems (MLS). The final goal is to develop a MLS that would be interesting enough to attract students to use it and have the opportunity to gain knowledge, without entirely sacrificing their social networking needs. To develop such system we conducted a survey and collected data about the students' affinities and needs. In this paper we present the results of the survey and propose a framework of prerequisites that a novel MLS should incorporate.

Keywords - Information technologies, Social media, Multimedia learning.

I. INTRODUCTION

THIS research concentrates on three crucial moments: the benefits of multimedia learning, the current situation with knowledge of high school students in Macedonia and the social media usage. In the context of learning by the aid of multimedia, the research in the past few decades inevitably implies that implementing multimedia in education is highly beneficial to learning by providing improvements to students' cognitive abilities, acceleration of memorization and alleviation of understanding of abstract, micro and macro entities. For example, Lee et al. [1], as pioneers in the field of multimedia learning, reported that this method of instruction demonstrates great capacity to enhance traditional teaching. They also show that, when applied correctly, it can bring breadth and depth to the subject, render efficient use of class time, create flexibility in teaching and enhance students' learning. Mayer [2], as one of the greatest researches in the field, also concluded that, under some conditions, multimedia learning can lead to substantial improvements in learning and

that students are better able to make sense of scientific or mathematical explanations when they are able to hold relevant visual and verbal representations in working memory at the same time. Garcia et al. [3] showed that, in some specific case of descriptive geometry, the use of flash animations accelerates the development of students' spatial perception. Lin et al. [4] investigated the potential benefits of using animation, visual cueing, and their combination in a multimedia environment designed to support learners' acquisition and retention of scientific concepts and processes, concluding that participants provided with animations retained significantly more concepts than their colleague peers provided with static graphics. Kim et al. [5] explored the effects of gamification of learning and concluded that, after some period of adaptation, the learning curve is quite steeper than with regular learning. Similar conclusions are presented by many other researches, such as: Arcelli et al. [6], Mayer et al. [7], Milovanovic et al. [8], Pérez-López et al. [9], Barra et al. [10], Surjono et al. [11], Tibbitts et al. [12], Gilakjani [13], Kumar et al. [14], Bittman et al. [15], Mai et al. [16], Chen et al. [17], Marsono and Wu [18], Adesope et al. [19], Ocepek et al. [20], Danielson et al. [21], Leow et al. [22], Smith et al. [23], Mayer et al. [24], Jeong et al. [25], Scheiter et al. [26], Park et al. [27], Schweppe et al. [28], to name a few. In addition, the effort of Almara'beh et al. [29], that explored the effectiveness of multimedia learning, confirm that multimedia technology empowers the educational processes by means of increased interaction between students and teachers, which makes learning more dynamic and longer lasting and it is applicable in the world outside the classroom. Thus, we know the benefits, but some questions arise. Do we properly implement multimedia technologies in education? Are the students inspired to use multimedia in their learning?

The statistics about social media, on the other hand, reveal that their usage is still getting momentum. According to Brandwatch [30], as of January 2019, there are 3.397 billion active social media users in the world. The number of social media users has grown by 320 million users between September 2017 and October 2018, which implies that there are almost 10 new social media users each second. The average daily time that people spend on social media is almost two hours and 81% of the teenagers feel that social media has a positive effect on their lives.

But, if we analyze knowledge statistics like the World Bank

report on public expenditure for FYR Macedonia (Report No. 93913-MK) from 2015 [31] and the results of the latest PISA testing [32] of the same year of 2015, we can observe some disturbing results. The report from the World Bank [31] explains that *"The quality of primary and secondary education seems to have declined", "In 2013, Macedonia's spending on education of 4.1 percent of GDP was the highest in the region, but its education performance indicators were below the regional average. The quality of primary and secondary education has not improved significantly over the last several years, as measured by international tests. Scores on the Trends in International Mathematics and Science Study (TIMSS) declined significantly between 1999 and 2011, and are below other European countries.", "The levels of skills and knowledge of Macedonian students lag behind those of students in comparable countries. For example, on PIRLS 2006, which assesses children in the fourth year of formal schooling on a range of reading comprehension strategies, fewer children reached the lowest benchmark in FYR Macedonia (55%) than all neighboring and EU countries which participated (the next lowest was 83% for Slovenia). On the TIMSS assessment, which test children in grade 8 in mathematics and science, Macedonia did significantly worse between 1999 and 2011 as the average mathematics score fell from 447 to 426, with no other European country scoring less. The proportion of FYR Macedonian students who achieve the minimum standard (the 'low international benchmark') fell from 70 percent to 61 percent in mathematics and from 73 percent to 53 percent in science".* Regarding the PISA testing [32], the results showed that 62.9% of the Macedonian high school students are on or below level 1 (from max. of 6) for science, and in mathematics and reading that percentage is even higher (just above 70%). This average in OECD countries is below 20%, which indicates quite large difference in knowledge of students in OECD countries compared to Macedonian students. Level 5 for Science and Reading was reached by only 0.2% of Macedonian students where the OECD average is 6.7% and 7.2% respectively, while level 5 for mathematics reach only 0.7% with OECD average of 8.4%.

Putting these three moments together we learn that multimedia technologies and multimedia contents bring multitude benefits to education and learning, that the world population, especially young people, increasingly use Information, Communication and Multimedia (ICM) technologies, but the knowledge they gain stays stable (with slight decline) and for some countries, such as Macedonia, it deteriorates. Consequently, the question "why is this happening" arises and is there something we can do to prevent it? In this manner, we conducted a survey in a municipality in Macedonia, to search for some answers concerning the high school students' behavior regarding the usage of ICM technologies, in or out of the school, for the purpose of their education. The final goal of this research is to propose a framework of prerequisites that a novel Multimedia Learning System (MLS) should incorporate. The system should be

interesting enough to attract students' use and provide them the opportunity to gain knowledge without entirely sacrificing their social networking habits. We believe that this can be accomplished by searching for an opportunity to partly divert students from social media usage to spend certain time on MLSs. The survey provided quite interesting but expected results that we present henceforth.

The rest of this paper is organized as follows. Chapter 2 gives an overview of Learning Management Systems (LMSs) and MLSs, their advantages and the obstacles for their implementation to support education in the context of multimedia learning. This chapter presents the motivation for this research as well. In chapter 3 we present our findings from the conducted survey among the high school students in a single municipality in Macedonia. In chapter 4 we discuss the survey results and we disclose essential prerequisites that a novel MLS should satisfy. Chapter 5 presents the concluding remarks and our projections for future work.

II. RELATED SYSTEMS AND MOTIVATION

A systems' category that offers certain possibilities for multimedia learning is the category of LMSs. Moodle [33], for example, is used for blended learning, distance education, flipped classroom and variety of e-learning projects in schools, universities and other workplaces. With customizable management features, it is used to create private websites with online courses for educators and trainers to achieve certain learning goals. Blackboard Learn [34] is a virtual learning environment and course management system. It is a Web-based server software that features course management, customizable open architecture and scalable design that allows integration with student information systems. Its main purposes are to add online elements to courses that are traditionally face-to-face delivered and to develop complete online courses with a few or no face-to-face meetings. Blackboard Learn provides users with a platform for communication and sharing content. Regarding the communication, the system enables posting announcements for students, students' chats, discussions and e-mail. Edmodo [35] is an educational system that offers collaboration and coaching platform to schools and teachers. The Edmodo network enables teachers to share content, distribute quizzes, assignments, and manage communication among students, colleagues, and parents. Edmodo is very teacher-centric in its design and philosophy, while students and parents can only join Edmodo if invited by a teacher. Many other platforms offer similar features, such as Ilias [36], Google Classroom [37], Canvas LMS [38], Sakai [39], Litmos LMS [40] etc., but what is common for the aforementioned LMSs is that they are mainly course management platforms that offer some features for multimedia learning, but cannot be easily customized to function as an MLS. The presented LMSs are not out of the box solutions and their administration can sometimes be difficult and not very user friendly, especially if someone tries to implement an MLS over an LMS platform. Furthermore, the teachers are usually not able to easily download an LMS and

be up and running the next minute with all the necessary preparations for multimedia learning.

With such situation with the LMSs and the specific requirements for multimedia learning, many efforts present designs of specific MLSs. In this manner, Lock Yen Low et al. [41] in 2003 outline the details of the development and deployment of a novel MLS, starting from content development flow to the implementation stage. The project is launched at the Multimedia University (MMU) in Malaysia. One of the drawbacks from the current point of view is that Adobe (Macromedia) Dreamweaver and Flash were used to develop the interactive environment within two university campuses. Nusir et al. [42] designed an interactive MLS for the children of primary schools in Jordan. After implementation, the authors reported improvement of students' abilities and their learning skills. Huang et al. [43] presented the design of an online MLS for improving students' perceptions of learning English. The system is constructed as a quiz offering video learning content. The experimental results demonstrated that students had a positive view of the functions of the video supported quiz system.

To summarize the characteristics of these systems, as we mentioned earlier, the LMSs are not quite convenient for implementation as MLSs and the specific MLSs are proprietary systems, build to suit certain educational environments. These properties make current LMSs and MLSs highly unsuitable for implementation, which was the main motivation to search for an alternative solution that would fulfill the projected goals of learning enhancements with a novel MLS according to the specific requirements of the stakeholders involved.

III. THE SURVEY

To explore the students' affinities and needs we conducted a survey among the high school students from all study years in eight schools from a single municipality in Macedonia. The survey was concentrated on the usage of ICM devices during or out of classes, for the purpose of learning (the use of multimedia content for learning, exchange of learning materials and communication with colleagues and teachers) and whether those technologies are helpful to students' improvement of acquisition of knowledge. The population of high school students in the municipality is 3.764 and the population of high school students in the country is 71.650. The sample from which we received filled survey responses was 166, thus, regarding the municipality, the widest confidence interval (at 50% of answers) at a confidence level of 95% is 7.44. Consequently, the widest confidence interval regarding the whole population is 7.6. In the following charts we present our survey findings that lead to some quite interesting resolutions.

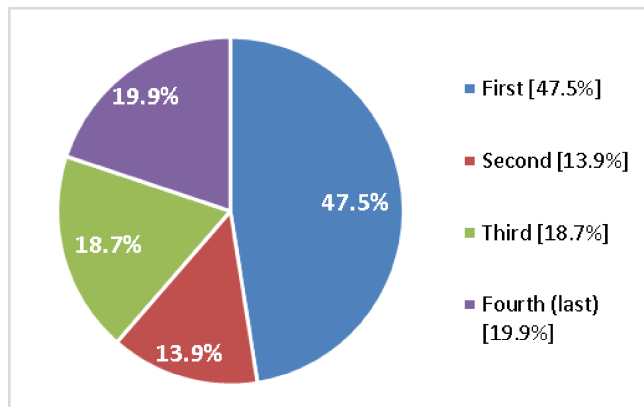


Figure 1: Distribution of survey respondents by year of study.

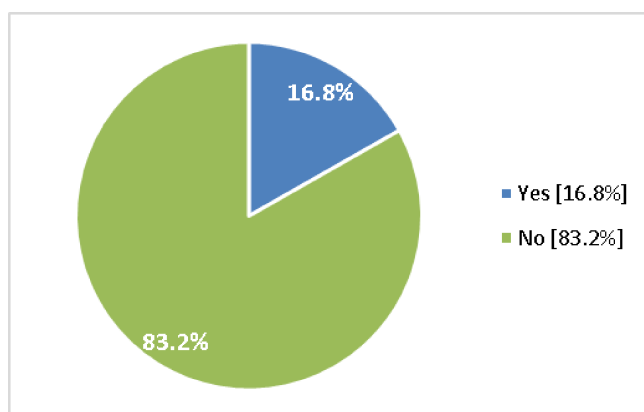


Figure 2: Distribution of subjects in which students use ICM devices and multimedia content.

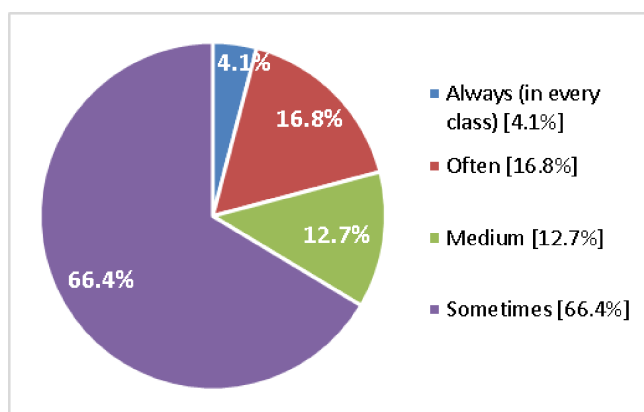


Figure 3: Frequency of usage of ICM technologies in classes of the 16.8% of subjects that implement ICM technologies.

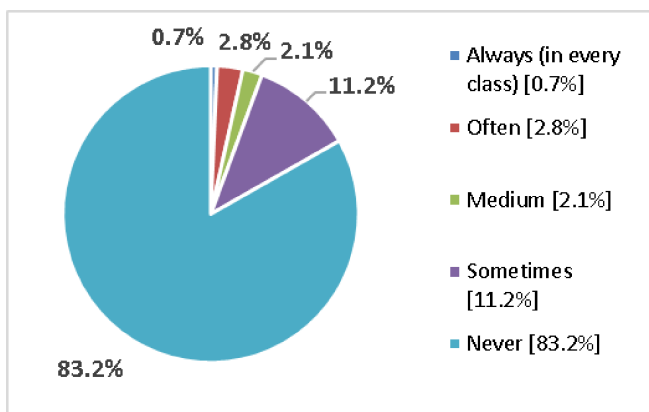


Figure 4: Frequency of usage of ICM technologies in classes of the total number of subjects.

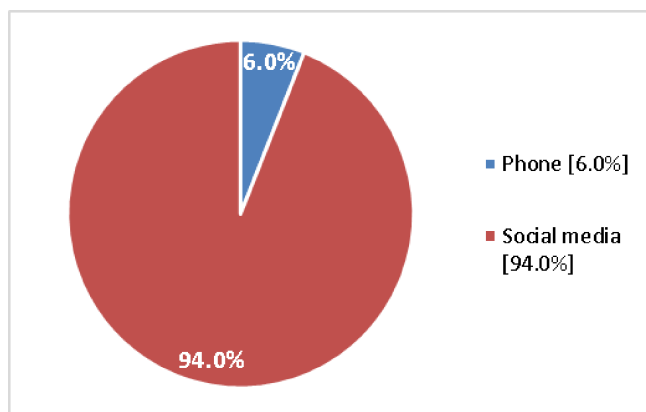


Figure 7: Most popular means for communication between students out of school premises.

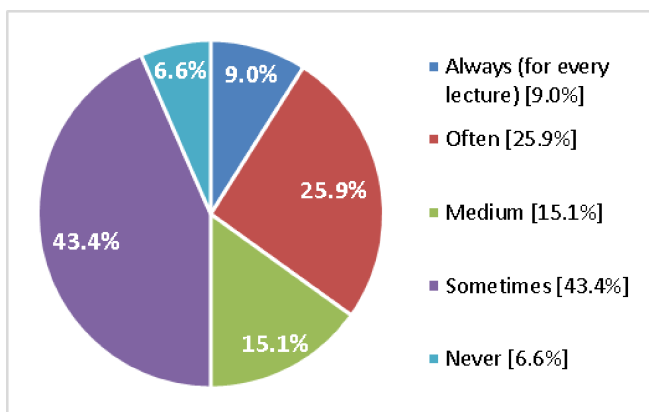


Figure 5: Students' frequency of searching for multimedia content to support their learning while studying at home.

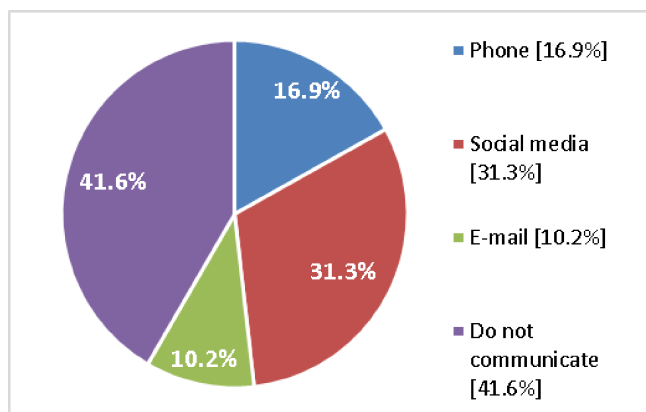


Figure 8: Most popular means for communication between students and teachers out of school premises.

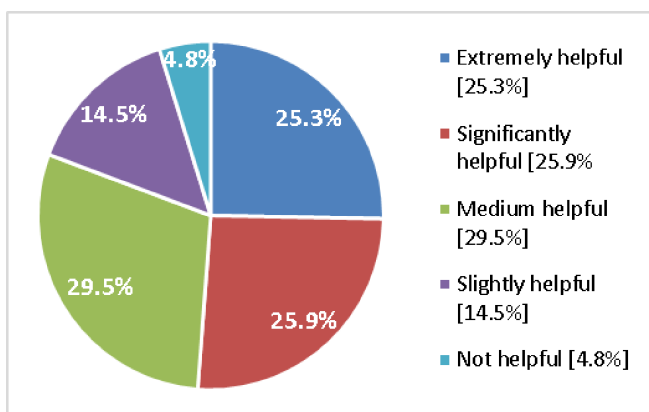


Figure 6: Helpfulness of multimedia learning according to student respondents.

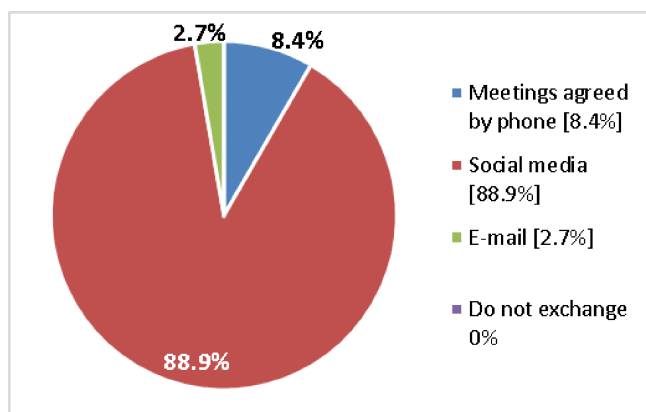


Figure 9: Most popular means for exchange of learning materials between students out of school premises.

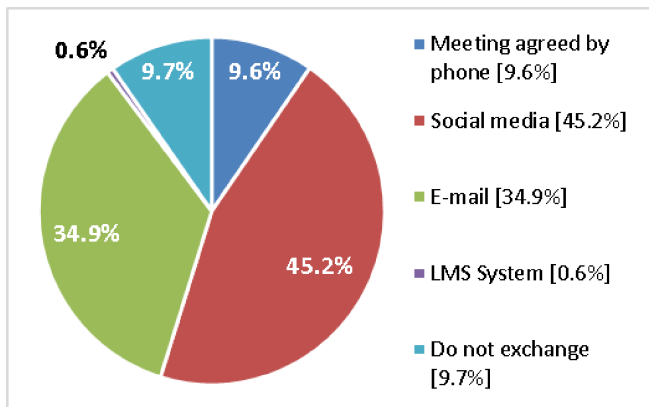


Figure 10: How do students most often receive learning materials from teachers out of school premises?

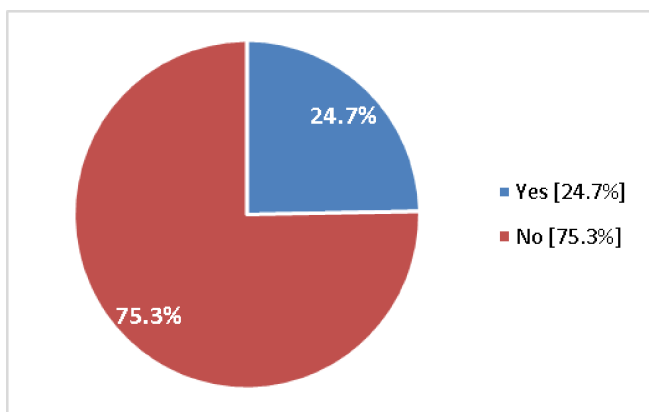


Figure 11: Students' usage of some LMS platform, such as Moodle, Edmodo, ATutor, Google Scholar etc.

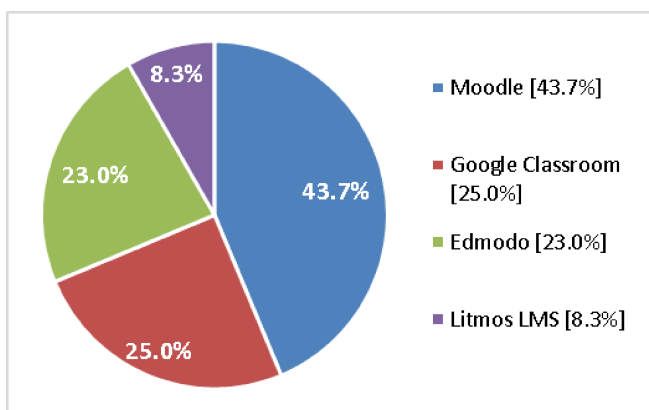


Figure 12: Distribution of usage of different types of LMSs for the 24.7% of students that sometime use LMS.

IV. DISCUSSION

The first noticeable finding of the survey is the fact that in only 16.8% of all subjects the students are allowed to use ICM devices such as desktop/laptop, tablet or smartphone, for the purposes of learning (Figure 2). This is the basic obstacle that

needs to be overtaken in order to enable the possibility for educational processes to advance using contemporary trends and multimedia technologies. It doesn't necessarily mean that ICM devices and multimedia content should be extensively used in every class lecture, but it is surely recommended that each subject implements some multimedia learning. The frequency of usage of ICM devices and multimedia learning content for the aforementioned 16.8% of all subjects is another unsatisfactory indicator (Figure 3). With only 20.9% of often to always to 66.4% of only sometimes we can conclude that the usage of multimedia content in classes is pretty scarce. If we represent this frequency against the total number of subjects and classes (Figure 4) we come to a tiny percentage of 3.5% for often and always, 2.1% of medium usage and only 11.2% of occasional usage.

But, is this what students need? Are they satisfied with these percentages of multimedia learning? Figure 5 and Figure 6 strongly indicate that the answers to these questions are negative. Almost 35% of the students often to always search for multimedia content on Internet to support their learning at home, and even 50% of them search for multimedia content for about the half of the lectures. Only tiny 6.6% of the students are not interested in learning with an aid of multimedia. What is even more promising is the fact that students find multimedia learning quite helpful. 51.2% of the students find multimedia learning significantly to extremely helpful and 29.5 answered that multimedia content is of medium help to their learning. Only 4.8% find it not helpful.

One of the most noticeable observations of this survey is the way that students communicate with each other out of the school premises. Figure 7 shows that 94% of the students use social media (Facebook, Twitter, LinkedIn etc.). Social media are the most popular for exchange of learning materials as well with 88.9% (Figure 9). Similarly, social media are also the most popular means for teachers to deliver learning materials to their students with 45.2%, while 34.9% of teachers prefer e-mail delivery (Figure 10). Even the communication between students and teachers out of school is basically conveyed via social media, even though more than 40% of the students have no communication with the teachers out of their schools (Figure 8).

Besides the usage of multimedia learning content and communication technologies, we were interested in the usage of Learning Management Systems (LMS). The majority of LMSs are basically class management systems and offer little options for multimedia learning, but it is an indication of the current situation in the schools and their interest in implementation of new technologies. It turned out that only 24.7% of students use LMS (Figure 11) and the most popular ones are Moodle, Google Classroom and Edmodo with 91.7% of combined coverage (Figure 12).

If we summarize the discussion we can compile several critical resolutions:

(i) High school students extensively use social media for multiple communication purposes, including exchange of

learning materials with their colleagues. As the statistics of Brandwatch [30] revealed, even 81% of the teenagers feel that social media has a positive effect on their lives. Through the social media they exchange colossal amount of information, but the sad part of such information exchange is that it rarely contributes to their learning and knowledge.

(ii) High school students are quite fond of using multimedia content to support their learning and find it very helpful. Many of them search for such content on their own because they do not receive multimedia learning support during their classes at school.

(iii) LMSs are not tailored for multimedia learning and are not easily deployable, while the rare MLSs are proprietary systems with features specific to the environment of their deployment.

(iv) Multimedia learning resources are scarce and have to be made for the specific requirements of the lectures.

These resolutions unavoidably lead us to a conclusion that a novel MLS may be the solution that will enhance learning and provide help to provision of knowledge. But, if we want to introduce a new system for students that are already used to working with popular social media, we must carefully plan its development. We believe that if we could divert some of the time that students spend working of social media to work on multimedia learning to gain knowledge, without them sacrificing their habits and communications, we may have a tangible solution.

As an outcome, we postulated the following essential prerequisites that a novel MLS should satisfy. Thus, the system should:

- be specifically tailored to the requirements of the educational system of implementation in compliance with the official learning materials issued by the government for the students in each year of study;
- enable all users to create and share multimedia content and connect the content to a specific lecture, but the introduction of newly created multimedia content should be controlled by one of the teachers that teach the corresponding subject;
- incorporate communications and incentives similar to the ones offered by the contemporary social media, in order to provide the users with some features that they are quite familiar with, and fond of as well;
- offer interconnection with the most popular social media services, such as Facebook, Twitter etc.;
- promote grading awards for the most productive students of multimedia content;
- be built simple, intuitive and user friendly, designed with a simple and clean interface;
- offer easily searchable content.

In our previous research [44] we already proposed an architecture for MLS with social networking features, based on a series of interviews conducted with high school teachers and this research supports our belief that such system will foster the provision of knowledge.

V. CONCLUSION

In this research we explore the possibilities to support learning and knowledge for high school students by development proposal of a novel MLS. In the present world, vast amounts of information are exchanged every minute and social media are becoming more popular every day. Such situation easily misleads that the more information available would mean more knowledge, but the latest international reports and testing results about the secondary education in Macedonia speak otherwise. The World Bank report [31] and the PISA testing results [32] reveal that the knowledge of Macedonian high school students is declining and lags quite behind the average of OECD countries. On the other hand, world statistics show that social media are extremely popular among teenagers and they even believe that social media have a positive effect on their lives. Taking into account the popularity of social media and the benefits of multimedia learning we conducted a survey among the high school students in a municipality in Macedonia to seek for an answer whether a novel MLS that will include social media features would present a solid support to learning. The survey revealed some interesting insights that students are quite fond of multimedia learning and find it highly helpful, but struggle to find appropriate multimedia content. Furthermore, their most popular means for communication and exchange of learning materials are the social media like Facebook, Twitter, LinkedIn, and e-mail communication has certain popularity as well. Since well-established LMSs are mainly built for class management, they are not easily implementable for multimedia learning, at least not for the specific requirements of a certain educational system. For this reason we propose several important prerequisites for a novel MLS that would support learning and knowledge. The idea is to partly divert student to use a MLS instead of just social media and therefore social media features must be included in the new learning system. In a previous research we already proposed an architecture for such system and this research of the behavior of high school students from Macedonia supports the proposed idea. Our future work will include activities for planning and development of the novel MLS and analyses after a certain period of usage. The idea is to achieve construction of a system in which every student can cooperate in order to facilitate and improve the effectiveness and efficiency of the MLS.

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