# Chapter 5
# A Survey on Recent Learning Approaches in School Education Using Edmodo

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## ABSTRACT

*Edmodo is a platform combining social networking and learning. It provides functionality addressed to tutors, students, and parents of young students. It attempts to exploit the popularity of social networking and tailor it to the needs of education. Access to Edmodo functionality is freely available. Open educational resources involving various subjects and different languages are available within Edmodo. Edmodo users may search for and retrieve such resources. Many learning approaches using Edmodo have been implemented in school education. The results are positive in various aspects. This chapter surveys approaches using Edmodo in school education. The survey focuses on the most recent approaches. The research results are analyzed. An important result that has been derived from several approaches is the improvement in learning. The surveyed approaches generally demonstrate the usefulness of Edmodo in school education. Furthermore, social learning platforms may be used to disseminate open educational resources and integrate them in school education practices.*

## INTRODUCTION

Educational technology is the combination of technological tools and methodologies used in educational settings in order to satisfy specific educational needs (Roblyer & Doering, 2013). Educational technology may involve various types of devices and applications (Prentzas, 2013). The main purpose is to

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provide advantages compared to alternative learning approaches that are not using technology (Roblyer & Doering, 2013). This is achieved by exploiting technological features that offer benefits to students and tutors. The benefits anticipated from educational technology are several. It is needless to say that a main anticipated benefit involves improved learning (Roblyer & Doering, 2013) as also seen from the research aims of corresponding research studies.

In this context, the Internet plays an important role. This role was intensified with the advent of the World Wide Web and the widespread use of Web-based resources and tools. The advantages and popularity of the Internet have led many tutors to exploit it in school education. This trend has led to blended learning approaches that combine classroom and Internet-based learning (Horn & Staker, 2011). There are several advantages of blended learning as reported in literature. Generally speaking, blended learning approaches have the potential to provide enhanced learning experiences by exploiting the benefits of both classroom and Internet-based learning (Horn & Staker, 2011; Bonk & Graham, 2012).

The advantages that the Internet may offer in blended learning concern several aspects. Students have the ability to learn and interact with others beyond classroom hours. Therefore, students may work anywhere and anytime (Wardono, Mariani, Rahayuningsiha, & Winartia, 2018). Students and tutors may communicate in classroom and through the use of a wide range of synchronous and asynchronous communication tools (Bonk & Graham, 2012). Internet-based resources provide students the motives to learn as their attention is attracted and they are encouraged to take part in creative activities (Roblyer & Doering, 2013; Yusuf, Yusuf, Erdiana, & Pratama, 2018; Wardono et al., 2018). Students gain access to educational content of various types. The educational process is focused on students and adapted to their characteristics (Hairunnisah, Suyitno, & Hidayah, 2019; Prentzas, Hatzilygeroudis, & Koutsojannis, 2001). Cooperative learning approaches may also be employed using the infrastructure of the Internet (Wrahatnolo, Wibawa, & Wahono, 2019).

Face-to-face classroom learning provides advantages that blended learning approaches exploit. Learning through face-to-face interaction enhances the bonds among students and among students and tutors. Face-to-face interaction facilitates students and tutors because they co-exist in the same classroom. The diversity of this interaction cannot be replaced by pure Internet-based learning. Research studies have shown advantages of blended learning approaches compared to traditional classroom instruction (Safiri & Suparwoto, 2018; Rahmawati, Muryani, & Sarwono, 2018; Bonk & Graham, 2012) and pure Internet-based learning (Bonk & Graham, 2012).

Open educational resources (OER) are very useful in blended learning approaches as they are publicly available which facilitates their use (Piedra, Chicaiza, López, & Caro, 2016). OER may involve any resource, application or tool that can support learning. For instance, OER may be related to all types of learning activities, courses, course material, repositories, digital textbooks and workbooks, guides, demonstrations, syllabi, software, multimedia items and Virtual Learning Environments, among others (Atkins, Brown & Hammond, 2007; Butcher, 2015).

Web-based platforms with free access assist in the dissemination of OER and the implementation of blended learning approaches. Edmodo is such a platform. More specifically, Edmodo is a social learning platform that facilitates interaction among the different types of users involved in education as well as the sharing and retrieval of OER. Several approaches have been presented that integrate Edmodo in school education. It is thus useful to analyze the derived research results in order to draw conclusions about the effectiveness of these approaches and disseminate good practices.

This chapter surveys recent approaches using Edmodo in the context of school education. The survey will be useful to tutors, researchers, policymakers and institutions that work towards the integration of

OER in education. It will also be useful to developers implementing corresponding open tools. It should be mentioned that there are surveyed studies showing that blended learning supported by Edmodo improves learning in school education. This aspect is discussed in the corresponding sections of this chapter.

This chapter is organized as follows. The following section provides background knowledge. Next, twenty-five recent approaches using Edmodo in primary and secondary education are briefly discussed. Further on, a discussion about the derived results is presented and future research directions are outlined. Finally, the chapter concludes.

## BACKGROUND

In this section, background knowledge involving the subject of the chapter is provided. It concerns ways of learning and Edmodo functionality.

### Ways of Learning in the Digital World

This section briefly discusses different ways of learning involved in the surveyed approaches and provides references to related work. More specifically, the following are discussed:

1. Cooperative learning.
2. Inquiry-based learning.
3. Network peer learning.
4. Project-based learning.
5. Content and Language Integrated Learning (CLIL).
6. FSLC (Formulate, Share, Listen, Create).
7. Reciprocal teaching.
8. Problem-based learning.
9. SECI (Socialization, Externalization, Combination, Internalization).
10. Contextual Teaching and Learning (CTL).
11. Scientific method. Obviously, the roles of teachers and students are adjusted according to the context of each way of learning.

In cooperative learning, "students work together to achieve shared goals" (Johnson & Johnson, 1989; 1999). More specifically, students work in groups and depend on each other to improve their own and their co-members' learning. Research studies showed that cooperative learning provides better results compared to competitive and individualistic learning in terms of achievement, quality of reasoning, required time for tasks and interpersonal relations (Johnson & Johnson, 1989).

Inquiry-based learning is a learner-centered and self-managed way of learning. Students explore and solve problems and questions (Gibbs, 1988) they create themselves. They count on pre-existing knowledge and evidence they gather.

Network peer learning takes place through the Internet. It involves interaction among peers that have similar characteristics. Goals are achieved through exchange of knowledge, opinions, ideas, and evaluations (Topping, 2005). Learning is for anyone and about anything and may involve formal and informal settings (Andrews & Manning, 2016).

CLIL involves the combination of any learning subject with the use of a foreign or second language (Coyle, Hood, & Marsh, 2010). It is a multicultural approach in which students learn both the subject and the language (Šulistová, 2013). The goal of this approach is the easy learning of a language through real-life situations.

FSLC is a type of cooperative learning (Johnson, Johnson, & Smith, 1991) that may be used with questions or problems. It consists of four stages. First, students individually formulate an answer to a question or problem that arose during learning. Second, each student shares his/her answer with the other group members. Third, each student listens to answers provided by others noting similarities and differences. Fourth, a new answer is created by the group as a whole by considering the best points of individual answers.

Reciprocal teaching intends to improve the ability to learn from text (Palinscar & Brown, 1984). Students either individually or in small groups adopt the role of teacher. They perform four main activities concerning the text: (i) they summarize content, (ii) they clarify content by critically evaluating it, (iii) they prepare questions about content and (iv) they predict future content.

In project-based learning, projects are the main teaching strategy having a key role in the curriculum (Thomas, 2000). Projects focus on authentic problems or questions and involve multiple teaching subjects. The learning activities are constructive, challenging and result in knowledge transformation and construction. Students have considerable autonomy and a high sense of responsibility.

Problem-based learning is an approach that focuses on problems (Barrows, 1996). It is a student-centered process in which students work in small groups and tutors facilitate learning. Students assume the responsibility for their learning. For each problem, they need to determine the knowledge required for its handling and how they may acquire it (Barrows, 1996).

SECI constitutes a knowledge creation model based on the four dimensions of knowledge (i.e., socialization, externalization, combination, internalization). Socialization refers to transfer of knowledge, externalization is related to publication of knowledge, combination has to do with processing of knowledge and its possible transformation, and internalization involves acquisition and implementation of knowledge by learners (Nonaka, Toyama, & Konno, 2000).

CTL is based on students' interests and experiences (Satriani, Emilia, & Gunawan, 2012). Its purpose is to develop the ability of students to connect new knowledge with patterns of their everyday context (Satriani et al., 2012).

Finally, the scientific method is a learning process that resembles the research process followed by scientists (Lim, 2012). More specifically, students listen to or pose a question. They then try to answer to this question using pre-existing knowledge. If they cannot provide an answer, they make hypotheses and check them with experiments. They analyze the data and draw conclusions. They, then, share the results. The process is iterative as results may lead to refined hypotheses. This way of learning involves aspects such as inquiry, discussion, cooperation, analysis and experimentation.

## Main Functionality of Edmodo as a Learning Platform

Often blended learning approaches use a Web-based platform to support the learning process. Learning Management Systems (LMSs) are a type of such platforms. LMSs incorporate a suite of e-learning functionalities addressed to students, tutors and administrators. These functionalities involve, among others, creation, delivery and management of content, interaction among users, assessment, control and administration (Antonis, Prentzas, & Lampsas, 2008). However, other platforms besides LMSs may be

used in blended learning. The popularity of social networking platforms motivated researchers and tutors to explore their integration in education. This trend led to social learning networks, that is, social networks addressed to education and involving interaction among students, tutors, parents of young students and learning processes (Brinton & Chiang, 2014).

Edmodo constitutes a representative platform enabling the creation of social learning networks. More specifically, Edmodo is a free access platform combining features of social networking and LMSs. It may be used to support blended and distance learning approaches. It provides customized functionality addressed to each user type (i.e., student, tutor and parent) (Edsurge, 2013). In contrast to other social networking platforms, it does not allow users not related to a specific group or class to connect with the corresponding network of users (Kongchan, 2013). The tutor is the one who invites students and their parents to connect. Users may upload various types of items including hyperlinks and attached files. An important aspect is the availability of OER within Edmodo involving various subjects and different languages. Edmodo users may search for and retrieve such resources.

Tutors may use Edmodo to communicate with students, parents and other tutors of the educational unit, to manage educational activities and to trigger various group activities. They may assign tasks to students setting deadlines for their implementation (Balasubramanian, Jaykumar, & Fukey, 2014). They may monitor whatever has been assigned or submitted. They may monitor which students have or have not completed their assignment. Tutors may also submit comments, suggestions and grades involving implemented student tasks.

Students may use Edmodo to access uploaded items, to submit messages to other users, to submit their assignments and access items involving their assignment that have been uploaded by teachers (Edsurge, 2013). Parents of students may monitor the activities of their children (Edsurge, 2013).

Edmodo provides convenient functionality that has proven useful for the implementation of blended learning approaches in school education. For this reason, many schools are using Edmodo to enhance learning activities and provide the added value of technology to students and tutors. Furthermore, parents find it convenient to be able to monitor the progress of their children. Research studies such as the ones surveyed in this chapter have shown that Edmodo provides advantages and may improve learning in school education.

## RECENT APPROACHES USING EDMODO IN SCHOOL EDUCATION

In this section, indicative approaches using Edmodo in school education are outlined. The section is organized in three parts concerning primary school, junior high school and high school, respectively. Scholar Google was used to retrieve the corresponding approaches. Three main queries were given to Scholar Google. Each query contained two keywords, that is, 'Edmodo' and one of the following keywords: (i) 'primary school', (ii) 'junior high school' and (iii) 'high school'. The most recent approaches from the retrieved ones were retained starting from 2019.

### Edmodo in Primary School

Homanová and Prextová (2018) investigated the factors which influence the implementation of social networking between two participating primary schools. These schools decided to collaborate through social networking for the implementation of an activity of a project. Besides, this social networking

would serve communicative and organizational purposes of the function of each school. Edmodo was used to cover the above needs. The results showed that the teachers, who were familiarized in the use of technology, had no problem with the use of the platform. On the contrary, the teachers, who were not experienced with technology, showed fear in the innovation of social networking. Some of the non-users of technology felt afraid because there would be a direct comparison with the users of technology. Another important factor that prevents the realization of social networking by the Czech teachers as regards the communication and organizational function of the schools is the knowledge of English. The teachers were asked to provide feedback about the social networking activity. Their responses were analyzed to determine the main factors that hinder or promote social networking in schools. A main factor promoting social networking is the policy of the platform which allows the participation of students only after the consent of parents or guardians. However, not all parents were positive. More specifically, some parents had reservations about this innovation. Others were concerned about the dangers of the Internet and the time that pupils had to dedicate. Furthermore, certain parents opposed the creation of an e-mail account for their children. It was also mentioned that certain students lacked the required technological devices and connection to the Internet. The loss of the platform entry code was also a factor that created problems.

Symons and Pierce (2018) argue that traditional tests for Maths assessment do not adequately inform the teacher about students' mathematical reasoning and their general progress. Due to the above, the researchers wanted to investigate the mathematical ideas and reasoning of fifty-four fifth grade primary school students. The students were classified by their teacher into ten levels according to their math capabilities. Each group consisted of three to six students. Every week and for seven consecutive weeks, a problem would be given to students through Edmodo and this would be followed by an online guiding discussion by the first researcher. Then, the students of each group would try to solve the problem online in collaboration. In the last two weeks after the problems had been given to the students, no discussion with the researcher took place, but students worked together to discuss ways of resolving them. The researchers codified and analyzed the data of student discussions through Edmodo. From the results it appeared that the information received by the teacher about students' thoughts, especially the lower learning levels, is sufficient. In particular, they have a full picture of their ability to cooperate, communicate, investigate, and how they think. In addition, from the results it appeared that students whose performance was below the average level according to traditional evaluation benefitted from online collaboration as they became more confident.

Song and Wen (2017) tried to examine whether the personal mobile devices of students can facilitate and improve their learning in Science through an online environment with inquiry-based learning. The researchers selected twenty-eight sixth grade students. The applications proposed to be used by students in their mobile devices were Evernote, Skitch, Edmodo, camera and voice recording. Evernote is a network application that allows the use of video, notes and photographs. Skitch is an extension of Evernote, which gives the opportunity for annotations, image processing and as well as the taking of snapshots. Camera applications and voice recording have enabled students to gather data and reflect their learning. Both Skitch and Evernote were integrated into Edmodo, which was the main application that supported the exploration of students' learning. Students were very familiar with Edmodo. The mobile devices, used by students were iPads and iPods. The places in which students carried out their exploratory learning were their classroom, the school laboratory and their home. The students were supported by the above appliances in all workplaces. Edmodo was used in all stages of the students' researching process. The results showed that the exploratory ways of students' learning for the Science course were improved by

the use of Edmodo. In terms of improving students' learning through a Web-based exploratory learning environment, the findings were very encouraging.

Lee and Chang (2017) aimed to investigate whether students' understanding abilities can be significantly improved with online support or with online assessment by their classmates. Fifty-three students took part in this experiment. They were from two classes of the fifth grade of a primary school. The students underwent a pretest of their reading comprehension. Depending on the success on this test, they were placed in the experimental or the control group. The media used to carry out the research consisted of Edmodo and a Web-based textbook summarizing table. The responses of students in the experimental group were reviewed by students in the control group that provided feedback. The former revised their responses and resubmitted them for evaluation. Apart from the above, students in the experimental group completed a post-test for text comprehension, a test of their cognitive style and a thinking style detection test. They submitted the test responses for correction to students in the control group. The results of the research showed that online support by their classmates seemed to have more benefits over the online assessment by their classmates. Also, medium and low level students were assisted more than the other students. However, the students that were mostly assisted were the low level students.

Ariani, Helsa, Ahmad and Prahmana (2017) investigated Edmodo's support for improving fourth grade students' mathematics learning in an Indonesian primary school. The sample consisted of thirty-two students. The school had technological infrastructure and connection to the Internet. The researchers chose this particular school because it could technologically support the research study. A further reason concerned the cooperation that existed between them, a university department in education in Indonesia and the Australian government. According to the researchers, the subject of mathematics, as in the other countries of the world, is a compulsory subject and must be attractive. A pleasant way for students' engagement in mathematical education is to offer them digital learning through various learning platforms. The platform chosen for online learning was Edmodo. The lesson offered to students through Edmodo concerned the concepts and features of the cube and the parallelepiped. The educational design used was based on the ADDIE (analysis, design, development, implementation and evaluation) model. In the assessment, 72% of the students seemed to understand the aforementioned concepts and features. The researchers, also, concluded that Edmodo contributes to the interaction among students as well as the interaction among teachers and students. This is done through exchange of comments and messages, sharing of learning material, collaboration among students and display of appropriate Internet behavior.

Based on the position theory, Symons, Pierce and Redman (2016) attempted to investigate the mathematical identity of two fifth grade students, a boy and a girl. The students collaborated to solve mathematical problems. According to the teacher's assessment of the two students, the boy had a performance in mathematics above the expected level of his class, while the girl was below average. Edmodo was the learning environment chosen. Every week and for ten weeks a mathematical problem was offered to the two students by the researchers through Edmodo. The students solved the problems with asynchronous discussions without the intervention of their teacher or the researchers. The researchers analyzed the two students' attitudes about all problems discussed between them. The data analysis of students' discussions showed that both of them participated evenly and none of them tried to dominate discussions. In addition to this, it was found that the girl was very involved in problem solving. Furthermore, the above research demonstrated the great contribution of Edmodo's online collaborative environment.

Georgopoulou-Theodosiou (2016) investigated the learning outcomes and the compatibility of the CLIL method. Her research was conducted in the fifth and sixth grades of a primary school in Greece and involved forty-four students. The learning context was interdisciplinary and concerned the learning

fields of computing, English language and healthy nutrition. The project was called "Eat well - be healthy" and was designed to familiarize students with healthy nutrition habits and good practices. The researcher used project-based learning in both groups with the only difference that the digital learning resources were integrated into the teaching of the experimental group. For the realization of the learning activities, the researcher used resources such as MindMeister, Kizoa, Linoit, Utellstory, Issuu and Glogster. The Penzu application was used by the teacher-researcher to record comments about student activities. Finally, Edmodo and a wiki platform were used to support the online collaboration of students and to improve their learning outcomes. The results of the research showed that the CLIL method is compatible with the Greek curriculum. According to the researcher, the CLIL method assists in the aspects of multiculturalism and multilingualism. Also, the teachers who teach English as a foreign language need to be trained in the CLIL method that has become popular in many European schools.

Thibaut, Curwood, Carvalho and Simpson (2015) focused on how teaching practices create a blended learning environment, teachers' views on integrating digital learning into face-to-face instruction, and ways in which teaching practices influence student activities when they work in a blended learning environment. The researchers collected data from thirty students of the sixth grade of a primary school and from teachers who taught the above students. The students and teachers were very familiar with ICT. The topic of the project which the above students were dealing with concerned thematic parks. The OER which were used by the students to carry out the assigned online activities were an LMS and Edmodo. The results showed that the blended learning environment gives teachers the opportunity to innovate with teaching practices which lead students to learn through new attractive learning paths. Also, students' interactions and teacher-student interactions are completely different from those of traditional learning because the former have a wide range of learning aspects such as learning independence, active learning and social experience.

The ways in which teachers and students of the sixth grade use Edmodo for teaching and learning purposes respectively, as well as the contribution of the platform to learning were explored by Thibaut (2015). Thirty students and four teachers were involved. The qualitative data came from in-depth interviews, discussions and interactions of students and teachers through Edmodo. The results of the qualitative analysis showed that teachers actively participated in the interactions of students within Edmodo by constantly guiding them. For their part, students seem to be supported through Edmodo and have opportunities to improve their learning and writing. Students were also able to engage in dialogues and present their views in the context of dialogue communities. However, not all students benefit. For some students, the social networking platforms are supportive. However, for other students they are not supportive because their active presence and their mood depend on their self-confidence. The results have shown that teachers need to be very careful in the design of learning activities. They need to provide appropriate learning activities through appropriate social media tools in order to meet their teaching objectives. This will highlight the facilitating and guiding role of the teacher in blended learning environments.

## Edmodo in Junior High School

Pertiwi, Kariadinata, Juariah, Sugilar and Ramdhani (2019) used Edmodo in seventh grade mathematics. They investigated students' abilities in mathematical proof and their attitude towards the blended learning environment based on Edmodo. The sample, sixty-eight students of seventh-grade, was divided in two groups, the experimental and control group. The researchers classified all students at three levels of mathematical proof abilities (i.e., low, medium and high) according to their previous abilities.

The control group solved the mathematical problems with the conventional teaching method while the experimental group used the blended method based on Edmodo. Based on the analysis of the quantitative and qualitative data, there seems to be a difference between the blended method and the traditional method of mathematical proof. The results were better for the blended learning method. It also seems that the performance of all students in the experimental group increased. Finally, it was found that the Edmodo-based learning environment was attractive and enjoyable and students in the experimental group had a positive view of the platform.

Widyaswara, Wardono and Asih (2019) investigated the effectiveness of the FSLC method in enhancing mathematical ability of seventh grade students. The researchers created three groups of students according to the level (i.e., low, medium and high) of their mathematical ability. Each group consisted of two students. The specific mathematical subject concerned the perimeter and area of quadrilaterals and triangles. The intervention in the control group was designed to take place with the discovery method, while in the experimental group it was designed to be performed with the FSLC method. The teaching intervention based on the FSLC method was supported by Edmodo. The findings of the research showed that the teaching intervention supported by Edmodo was more effective than the one that was not supported by Edmodo. The learning profiles of students in the experimental group were as follows. Students with a low mathematical ability had a quite good presence and acquired the ability of mathematical design, the use of mathematical symbols, terms and functions in a totally non-mathematical way. Students with a medium math profile improved their ability to exchange ideas, mathematical skills, presentation and invention of strategies and techniques regarding problem solving. Finally, high profile students have been able to improve on a good level the exchange of views, mathematical skills and mathematical reasoning.

Hairunnisah et al. (2019) used problem-based learning to study students' mathematical literacy in relation to difficulty and gender. The sample of the research study consisted of students in the eighth grade of a junior high school in Indonesia. The sample was randomly chosen. Random choice emerged from three categories of students: 'climbers' (who look for the challenge and choose very difficult activities), 'campers' (who choose activities of average difficulty) and those who easily abandon their tasks. Two students, one boy and one girl were selected from each category of students. The six students were divided into two groups. The teaching of the one group was supported by Edmodo. This was not the case for the other group. The results showed that the teaching supported by Edmodo was more successful in highlighting students' mathematical abilities. Boys and girls belonging to the class of climbers showed a good level of mathematical abilities. However, boys seemed to perform slightly better than girls. The mathematical abilities for students (boys and girls) belonging to the 'campers' class were quite good but seemed that they needed improvement. The students (boys and girls) who belonged to the third category underperformed compared to 'climbers' and 'campers'.

Shalihah, Supramono and Abdullah (2019) tried to identify the impact of the blended learning environment on problem solving skills. The research sample consisted of twenty-four seventh grade students. They were divided into four working groups. The subjects which students dealt with during the research (three weeks) concerned the problems caused by air pollution. To investigate the environmental problems, students were assessed by their responses to the indicators of problem solving. Students' ability to solve environmental problems was assessed. The performance of students in all groups was improved at all stages of problem solving. However, the performance of students in two groups was not improved in all indicators. According to the researchers, this was due to the fact that students in these groups did not know the causes of the specific environmental problems. As a result, students were not aware of the

ways with which these problems could be addressed. The researchers argue that the rich and detailed information provided to students through blended learning environments enhances problem-solving skills.

Wardono et al. (2018) compared three learning models to find out the difference in students' mathematical abilities. The learning models were the Project Based Learning Realistic Scientific approach with Edmodo (PBL-PRS-E), the Project Based Learning with Scientific approach (PBL-PS) and the Scientific approach (PS). The sample consisted of three classes of the ninth grade. The first one consisted of twenty-eight students and formed the first experimental group. The second one consisted of twenty-five students and constituted the second experimental group. The third one consisted of twenty-six students and formed the control group. PBL-PRS-E was used in the first experimental group, PBL-PS in the second experimental group and the scientific approach in the control group. The results of the research showed that students in the first experimental group improved their mathematical ability more than students in the two other groups. The researchers also claim that Edmodo gives interest and motivation to students as they can use it anywhere and anytime.

Vania, Setiawan and Wijaya (2018) investigated the acquisition of knowledge and the motivation of seventh grade students in thermal physics. The method used by the researchers was blended learning supported by Edmodo. In the specific junior high school, English is used as first language by students and teachers. The procedure followed during the research included the following steps. On the first day, the teacher informed students at school about the use of Edmodo. On the second day, the teacher introduced students to thermal physics. At the end of the lesson, the teacher uploaded the learning material and an exercise to the platform. On the third day, the teacher continued the teaching in thermal physics and assigned students another online activity. On the fourth day, the teacher led students to the school lab where he taught them conventionally and re-assigned them to work online. He, also, announced that the following day they would complete the post-test and a questionnaire. The results showed that the knowledge of students was significantly improved. Furthermore, there was an increase in students' motivation.

Prasetya and Taroreh (2018) conducted their research due to the low performance of seventh grade students in a test involving several learning subjects in Chemistry. The learning model used in the research was the SECI method. The teaching intervention of the researchers was a blended learning approach supported by Edmodo and concerned sixteen students, eight girls and eight boys. The blended learning intervention involved three different chemistry topics: acids and bases, neutralizing solutions and PH measurement of various basic and acidic solutions. Edmodo was used in all stages (Socialization, Externalization, Combination, and Internalization) of knowledge transfer. From the analysis of the research data regarding the SECI method supported by Edmodo, the researchers concluded that students' performance was improved.

Tsiakyroudi (2018) investigated how the use of Edmodo affected various aspects in the context of English as a foreign language. These aspects concerned students' behavior on writing, students' involvement in collaborative writing assignments and students' habits as for the production of written language. The research sample consisted of eleven ninth grade students in a Greek junior high school. Two activities were implemented in the context of English as a foreign language: (i) a famous Greek person's biography and (ii) provision of advice using e-mail. The researcher used Edmodo because she believed that students would become more involved in the production of written language due to platform features, polls and notes. She, also, believed that students' interest in collaborative writing would increase. The results of the research showed that the use of Edmodo for writing production in English had a positive influence on raising students' motivation and maintaining it at increased levels. The use of the social networking platform led to a change in students' attitudes towards the writing production. They, also, changed their

writing habits through the self-regulatory and autonomous processes provided by the platform. Finally, they realized that collaboration assisted in developing interaction, communication and involvement.

## Edmodo in High School

Wrahatnolo et al. (2019) sought to investigate the performance of tenth grade students of a vocational high school. The researchers chose, not randomly, two classes of the tenth grade that formed the control group and the experimental group in their quasi-experimental research. Each group consisted of thirty-two students. The subject of teaching intervention was related to computer network engineering skills. Cooperative learning assisted by Edmodo was applied to the experimental group students. Cooperative learning was also applied to the control group, but this group was not supported by Edmodo. Before and after the teaching intervention, the students completed pretest and post-test questionnaires, respectively. The results of the research showed a clear lead in the performance of students in the experimental group.

The level of readiness of high school students and teachers on the use of Edmodo, the needs for Edmodo-supported Geography teaching materials, the creation of Edmodo-supported learning material and the effectiveness of the above-mentioned material were examined by Indriani, Santoso and Sarwono (2019). The sample consisted of thirty-three students from all students of a high school and one teacher. Students filled in a questionnaire on their readiness to use of Edmodo and their needs for Edmodo-supported teaching material. The researchers, then, created the learning material that was tested by experts for possible improvements. Finally, the learning material was provided to the thirty-three students and the teacher asked their opinion on the material in a questionnaire. The results showed that students and teacher had the necessary readiness, online material was suitable for educational purposes and student performance in Geography was improved.

Yusuf et al. (2018) explored the ability of tenth grade students to write narrative texts in English using Edmodo. The sample, a class of twenty-three students, was randomly selected from seven classes. The research process was as follows. The students were asked to write a narrative text of three paragraphs about a person-legend who they would choose. There were teaching interventions that included group feedback through Edmodo and discussions in the classroom on narrative texts. Students were then asked to rewrite a narrative at Edmodo and publish it in the light of mistakes and omissions of their previous publications. Subsequently, the researchers gave students the post-test. They had to write a story of a different person in three paragraphs. They, then, completed a questionnaire on their attitude towards Edmodo. The results showed that use of Edmodo had a positive impact on students for the writing of narrative texts in English. The research results showed that Edmodo supported, not only, students in the writing process but also the teacher in process management. It also excited and motivated students to participate in the learning process.

Safitri and Suparwoto (2018) investigated the improvement of creative thinking skills of tenth grade students in Science through project-based learning. Two classes of sixty tenth grade students as a whole consisted their random sample. One class was the experimental group and the other the control group. The project of the two groups concerned the construction of a magnetic and a rocket car by recycled materials. The project was based on Newton's laws. The experimental group implemented, with the help of written instructions provided by their teacher, the construction of the cars through a blended learning environment supported by Edmodo. The control group built the two cars after discussions with their teachers in classroom. Based on the pretest and post-test data, the researchers concluded that the creative thinking skills of students in the experimental group had improved significantly.

The performance of tenth grade students in Geography with the use of the CTL method supported by Edmodo was examined by Rahmawati et al. (2018). The researchers used as a sample, not random, three groups of students. More specifically, two experimental groups and a control group were formed. The groups would be taught the methods of geographic research. The Edmodo-supported CTL method was used by the first experimental group. In the second experimental group, the same method was applied without the support of Edmodo. Control group students were taught using the lecture method. The analysis of the research data showed that the performance of students in the first experimental group was better compared to the performance of the students in the two other groups.

Bardakci, Arslan and Can (2018) investigated the views of students about their online experiences in a series of topics related to self-expression, their views for teachers, the factors that foster or make difficult their online discussions and the differences between online and face-to-face discussions. The sample consisted of thirty students (eighteen boys and twelve girls) from thirty different high schools in Turkey were involved. The ages of students who participated in the specific qualitative research ranged from 16 to 18 years. The research was conducted during teaching of the English language course. In the first two weeks, students were informed for the use of Edmodo and they discussed the details related to their access on the platform. The results of the research showed that on the one hand, students felt safe to formulate their views on the platform due to the presence of their peers and teachers. On the other hand, they seemed hesitant, because of the lack of confidence, to exchange their views with others. They clarified, however, that they can express their views with fewer restrictions at an online discussion than in the classroom.

Kayacan and Razi (2017) examined the effects of self-review or exchange of texts in English. The teaching subject involved the field of information technology. Students chose the topics of the text they wrote. Each text consisted of 150-200 words each. Students reviewed themselves the text they prepared. They also exchanged texts and provided feedback to their peers. The results showed positive effects of the self-review and peer feedback. However, the results were more positive with the feedback process. Students assessed positively both self-review and peer feedback. Nevertheless, certain students did not provide much feedback to their peers.

Vegh, Nagy, Zsigmond and Elbert (2017) focused their research on two main issues. More specifically, they examined how the use of Edmodo and ICT affect the attitude of tenth grade students towards biology. They also examined the type of learning style that contributes to improved learning when it is supported by ICT. The sample consisted of fifty-eight pupils from two classes of two Hungarian high schools. All students were in the same grade. The first class had thirty-five students and constituted the control group. The other class consisted of twenty-three students and formed the experimental group. Both groups were taught the same subjects of biology in previous grades. During the research, the control group was taught by the traditional method and the experimental group was supported by Edmodo. Both groups studied the biology subjects in English. Before the research was conducted, the attitudes of students in both groups towards biology were similar. After the research was conducted, the attitude of experimental group students was more positive than the attitude of control group students. The results showed that Edmodo brought the enthusiasm of the experimental group students. Concerning the second research question, the acoustic learning style dominated in the answers of the experimental group students.

## DISCUSSION

All of the twenty-five representative studies but one were conducted in a blended learning environment. The only exception was Homanová and Prextová (2018). In the overwhelming majority of research studies, students had the opportunity to use Edmodo in order to study the learning material and implement the tasks assigned by teachers at home or anywhere else. Also, possibilities were offered to students to interact with each other and their teachers in a safe environment within and outside the school.

Table 1 outlines the main research aims regarding the presented studies. It should be mentioned that there are studies with multiple research aims. Most researchers focused their research interests on the performance or the improvement of student learning supported by Edmodo (fifteen studies) as well as on students' attitudes and opinions about the use of Edmodo (four studies). It is reasonable for the researchers to focus on students' performance because this is a main issue in education. The expectation from technology is to assist in improving performance. The corresponding fifteen studies are shown in Table 2.

Table 3 outlines the teaching methods used by researchers in their teaching interventions. It seems that they used a variety of methods that appear to be compatible with blended learning. According to the data shown in Table 3, cooperative learning was used in more studies compared to the other methods. This is the case because the use of Edmodo favors cooperation.

Table 4 outlines the number of students involved in the presented studies. In most cases, the size of the research sample did not exceed fifty students. This is due to the choice of experimental research methods by researchers to collect their data. In certain methods, the experimental or control group may consist of twenty to twenty-five students at most.

*Table 1. Research aims*

| Research Aims | Number of Studies |
|---|---|
| Improvement in learning performance | 14 |
| Factors which influence the implementation of social networking | 1 |
| Mathematical ideas and reasoning | 1 |
| Students' mathematical identity | 1 |
| Blended learning environment impact and benefits | 2 |
| Ways to use Edmodo | 1 |
| Students' attitudes and views | 4 |
| Gender comparison | 1 |
| Method compatibility | 1 |
| Strategies' comparison | 1 |
| Comparison of learning environments | 2 |
| Students' motivation | 1 |
| Students' and teachers' readiness level on the use of Edmodo | 1 |
| Students' needs for Edmodo-supported Geography learning materials | 1 |
| Learning styles | 1 |

*Table 2. Studies aiming to improvement in learning performance*

| Studies |
|---|
| (Ariani et al., 2017)<br>(Georgopoulou-Theodosiou, 2016)<br>(Kayacan & Razi, 2017)<br>(Lee & Chang, 2017)<br>(Pertiwi et al., 2019)<br>(Prasetya & Taroreh, 2018)<br>(Rahmawati et al., 2018)<br>(Safitri & Suparwoto, 2018)<br>(Shalihah et al., 2019)<br>(Song & Wen, 2017)<br>(Tsiakyroudi, 2018)<br>(Vania et al., 2018)<br>(Widyaswara et al., 2019)<br>(Wrahatnolo et al., 2019)<br>(Yusuf et al., 2018) |

Table 5 outlines the school grades involved in the studies. The students of primary schools who participated were studying, mainly, in the fifth or sixth grade, the students of junior high school were studying, mainly, in the seventh grade and the high school students in the tenth grade.

Table 6 outlines the teaching subjects involved in the studies. Mathematics was the teaching subject that was taught in more studies than any other subject followed by the subjects of Science (four studies), English Language (four studies) and Geography (two studies). In three studies, there was no teaching intervention in some learning subject.

*Table 3. Teaching methods*

| Teaching Methods | Number of Studies |
|---|---|
| Cooperative learning | 4 |
| Inquiry based learning | 1 |
| Networked peer learning | 1 |
| CLIL | 1 |
| FSLC | 1 |
| Reciprocal teaching | 1 |
| Project-based learning | 1 |
| Problem-based learning | 1 |
| Project Based Learning Realistic Scientific approach with Edmodo (PBL-PRS-E) | 1 |
| Project Based Learning with Scientific approach (PBL-PS) | 1 |
| Scientific approach (PS) | 1 |
| Blended learning supported by Edmodo | 2 |
| SECI model based on the theory of knowledge transfer | 1 |
| CTL | 1 |

*Table 4. Size of research sample in the studies*

| Size Sample | Number of Studies |
|---|---|
| Fifty students at most | 16 |
| More than fifty students | 9 |

*Table 5. School grades involved in the studies*

| School | School Grades | Number of Studies |
|---|---|---|
| Primary school | 4th | 1 |
| | 5th | 4 |
| | 6th | 4 |
| Junior high school | 7th | 5 |
| | 8th | 1 |
| | 9th | 2 |
| High school | 10th | 7 |
| | 11th | 2 |
| | 12th | 2 |

Table 7 presents the OER which were used in the studies. One may note that in twenty-one of the twenty-five studies, Edmodo was the exclusive tool used. In the four other studies, Edmodo was used in combination with other resources (i.e., Evernote, Glogster, Issuu, Kizoa, Linoit, Mindmeister, Penzu, Skitch, Utellstory, an LMS, a Web-based textbook and a wiki tool). Researchers who used combined OER claimed that their results were positive.

Finally, it should be noted that in fifteen studies in which the researchers focused on students' performance or improving learning in a learning environment supported by Edmodo, the results were positive. Also, in four studies in which students' attitudes and views on the use of Edmodo were investigated, the results were also positive. These aspects are important as they demonstrate the usefulness of a tool such as Edmodo in education.

*Table 6. Teaching subjects involved in the studies*

| Learning Subjects | Number of Studies |
|---|---|
| Mathematics | 8 |
| Science | 4 |
| Text comprehension (Language) | 1 |
| English language | 4 |
| General topic | 1 |
| Geography | 2 |
| Computer network engineering skills | 1 |
| Biology | 1 |

*Table 7. OER used in the studies*

| Resources Used | Number of Studies |
|---|---|
| Edmodo, Evernote, Skitch | 1 |
| Edmodo, a web-based textbook | 1 |
| Edmodo, Glogster, Issuu, Kizoa, Linoit, Mindmeister, Penzu, Utellstory, a wiki | 1 |
| Edmodo, LMS | 1 |
| Exclusive use of Edmodo | 21 |

## FUTURE RESEARCH DIRECTIONS

Following the summary presentation of the twenty-five studies on the use of Edmodo in school education, most researchers state that they use Edmodo in blended learning environments. However, it seems that in their research they did not focus on a specific model of blended learning (e.g., rotation model, flex model, flipped classroom) supported by Edmodo. Future research studies could focus on the benefits of each blended learning model supported by Edmodo and the difficulties or problems that arise. Similarly, the different Edmodo-supported blended learning models could be compared. Such studies could derive useful results regarding the suitability of the various blended learning models in different contexts and provide useful guidelines to teachers.

Most teaching methods in the studies use the modern teaching methodology. However, one may note the absence of a differentiated learning approach supported by Edmodo. Differentiated learning may involve aspects such as learning objectives, content, teaching techniques and assessment. Furthermore, it aims at the improvement of learning in all learning levels. Research using Edmodo in the context of differentiated learning could be carried out.

As mentioned above, most studies involved the fifth and sixth grade of primary school, the seventh grade of junior high school and the ninth grade of high school. The results were positive. However, further results concerning all school grades are needed. In this way, a clearer picture will be formed about the use of Edmodo in education.

The research studies involved various teaching subjects. However, one may note that certain subjects (e.g. history) are missing. Therefore, future research studies could focus on such subjects. For example, the improvement of students' performance in history with the support of Edmodo could be examined in a future study.

The success of the surveyed approaches demonstrates that social networking platforms customized for educational purposes may prove useful. Social networking platforms may be used to facilitate the adoption of OER. Main factors affecting the adoption of OER is the ease of finding and selecting appropriate OER and the ability to evaluate OER or access others' evaluations of OER (Piedra et al., 2016). It is necessary to facilitate these tasks. Therefore, a future direction is the development of social learning platforms that facilitate creation and availability of OER, search for OER, integration and reuse of existing OER and evaluation of OER by students and tutors. Social networking platforms not specifically addressed to education may be also used to popularize OER providing links to them and to evaluations of them.

## CONCLUSION

Based on the summary presentation of the recent studies that concern the use of Edmodo in school education, one may reach the following conclusions.

Edmodo provides the opportunity to students to study the learning materials anywhere and anytime. It supports collaboration among students and teachers, mainly, outside of school. An important aspect concerns students' performance when Edmodo supports their learning. The results were positive in all studies in which the researchers aimed at student performance. Students with low self-confidence can express themselves more freely. Edmodo provides capabilities of feedback that improve the quality of learning. Also, students may study the learning material from a variety of educational digital resources that can be integrated into the platform.

The research aims covered a wide range of school education aspects. Most researchers investigated the effectiveness of Edmodo's use on pupils' performance. Perhaps, in the future, research studies concerning aspects of special education could be conducted.

According to the researchers, various teaching methods were used in the presented approaches which are compatible with the functionality provided by the learning platform. Example such methods are cooperative learning, project-based learning and inquiry-based learning. All these methods were used successfully in the corresponding educational settings. This demonstrates the flexibility of approaches supported by Edmodo.

The researchers used as samples, mainly, students of the two higher grades of primary education for their research. In the secondary education they used students, mainly, from the seventh and tenth grade. However, studies with students from all grades, mainly, in the secondary education, may lead to better conclusions about the use of Edmodo in school education. Dissemination and evaluation of OER used in approaches supported by Edmodo may also assist school education.

## REFERENCES

Andrews, M., & Manning, N. (2016). *A guide to peer-to-peer learning: How to make peer-to-peer support and learning effective in the public sector?* Effective Institutions Platform.

Antonis, K., Lampsas, P., & Prentzas, J. (2007). Adult distance learning using a Web-based learning management system: Methodology and results. In H. Leung, F. Li, R. Lau, & Q. Li (Eds.), *Advances in Web-Based Learning: Revised Papers of the 6th International Conference (LNCS)* (vol. 4823, pp. 508-519). Berlin, Germany: Springer.

Ariani, Y., Helsa, Y., Ahmad, S., & Prahmana, R. C. I. (2017, December). Edmodo social learning network for elementary school mathematics learning. *Journal of Physics: Conference Series*, *943*(1), 012056. doi:10.1088/1742-6596/943/1/012056

Atkins, D. E., Brown, J. S., & Hammond, A. L. (2007). *A review of the open educational resources (OER) movement: Achievements, challenges, and new opportunities*. Menlo Park, CA: Hewlett Foundation.

Balasubramanian, K., Jaykumar, V., & Fukey, L. N. (2014). A study on "Student preference towards the use of Edmodo as a learning platform to create responsible learning environment". *Procedia: Social and Behavioral Sciences*, *144*, 416–422. doi:10.1016/j.sbspro.2014.07.311

Bardakci, S., Arslan, O., & Can, Y. (2018). Online learning and high school students: A cultural perspective. *Turkish Online Journal of Distance Education*, *19*(4), 126–146. doi:10.17718/tojde.471909

Barrows, H. S. (1996). Problem-based learning in medicine and beyond: A brief overview. *New Directions for Teaching and Learning*, *1996*(68), 3–12. doi:10.1002/tl.37219966804

Bonk, C. J., & Graham, C. R. (2012). *The handbook of blended learning: Global perspectives, local designs*. San Francisco, CA: Pfeiffer Publishing.

Brinton, C. G., & Chiang, M. (2014). Social learning networks: A brief survey. In *Proceedings of the 48th Annual Conference on Information Sciences and Systems (CISS '2014)*. New York, NY: IEEE. 10.1109/CISS.2014.6814139

Butcher, N. (2015). *A basic guide to open educational resources (OER)*. UNESCO and Commonwealth of Learning.

Coyle, D., Hood, P., & Marsh, D. (2010). *Content and language integrated learning*. Cambridge, UK: Cambridge University Press.

Edsurge. (2013). *Edmodo: Popular education-centric social network for teachers, parents and students.* Retrieved May 3, 2016 from https://www.edsurge.com/edmodo

Gibbs, G. (1988). *Learning by doing: A guide to teaching and learning methods*. London, UK: Further Education Unit.

Hairunnisah, H., Suyitno, H., & Hidayah, I. (2019). Students mathematical literacy ability judging from the adversity quotient and gender in problem based learning assisted Edmodo. *Unnes Journal of Mathematics Education Research*, *8*(2), 180–187.

Homanová, Z., & Prextová, T. (2018). Implementation of education network in Czech elementary school. In *Proceedings of the International Conference on Computational Methods in Sciences and Engineering (ICCMSE '2018)*. Melville, NY: AIP Publishing. 10.1063/1.5079083

Horn, M. B., & Staker, H. (2011). *The rise of K-12 blended learning*. Lexington, MA: Innosight Institute.

Indriani, F., Santoso, S., & Sarwono, S. (2019). Development of e-learning material based on Edmodo in Geography learning. In *Proceedings of the 2nd International Conference on Research of Educational Administration and Management (ICREAM '2018)*. Paris, France: Atlantis Press. 10.2991/icream-18.2019.70

Johnson, D. W., & Johnson, R. T. (1989). *Cooperation and competition: Theory and research*. Edina, MN: Interaction Book Company.

Johnson, D. W., & Johnson, R. T. (1999). *Learning together and alone. Cooperative, competitive and individualistic learning* (5th ed.). Boston, MA: Allyn & Bacon.

Johnson, D. W., Johnson, R. T., & Smith, K. A. (1991). *Active learning: Cooperation in the college classroom*. Edina, MN: Interaction Book Company.

Kayacan, A., & Razi, S. (2017). Digital self-review and anonymous peer feedback in Turkish high school EFL writing. *Journal of Language and Linguistic Studies*, *13*(2), 561–577.

Kongchan, C. (2013). How Edmodo and Google Docs can change traditional classroom. In *Proceedings of the European Conference on Language Learning* (ECLL '2013). Nagoya, Japan: The International Academic Forum.

Lee, C. I., & Chang, C. C. (2017). Using the networked peer support strategy to enhance reading comprehension for students with various thinking styles. *Eurasia Journal of Mathematics. Science and Technology Education*, *13*(5), 1501–1515.

Lim, K. F. (2012). Teaching the scientific method in the curriculum. *Chemistry in Australia*, *2012*(April), 39.

Nonaka, I., Toyama, R., & Konno, N. (2000). SECI, Ba and leadership: A unified model of dynamic knowledge creation. *Long Range Planning*, *33*(1), 5–34. doi:10.1016/S0024-6301(99)00115-6

Palinscar, A. S., & Brown, A. L. (1984). Reciprocal teaching of comprehension-fostering and comprehension-monitoring activities. *Cognition and Instruction*, *1*(2), 117–175. doi:10.12071532690xci0102_1

Pertiwi, A., Kariadinata, R., Juariah, J., Sugilar, H., & Ramdhani, M. A. (2019). Edmodo-based blended learning on mathematical proving capability. *Journal of Physics: Conference Series*, *1157*(4), 042001. doi:10.1088/1742-6596/1157/4/042001

Piedra, N., Chicaiza, J., López, J., & Caro, E. T. (2016). Integrating OER in the design of educational material: Blended learning and linked-open-educational-resources-data approach. In *Proceedings of the IEEE Global Engineering Education Conference (EDUCON '2016)*. New York, NY: IEEE. 10.1109/EDUCON.2016.7474706

Prasetya, A., & Taroreh, K. (2018). The Implementation of socialization, externalization, combination, and internalization (SECI) through EDMODO application to improve student group's learning outcomes. In *Proceedings of the First International Conference on Education Innovation (ICEI '2017)*. Paris, France: Atlantis Press. 10.2991/icei-17.2018.2

Prentzas, J. (2013). Artificial intelligence methods in early childhood education. In X. S. Yang (Ed.), Artificial Intelligence, evolutionary computing and metaheuristics (pp. 169-199). Berlin, Germany: Springer. doi:10.1007/978-3-642-29694-9_8

Prentzas, J., Hatzilygeroudis, I., & Koutsojannis, C. (2001). A Web-based ITS controlled by a hybrid expert system. In *Proceedings of the IEEE International Conference on Advanced Learning Technologies* (ICALT '2001). New York, NY: IEEE. 10.1109/ICALT.2001.943910

Rahmawati, E., Muryani, C., & Sarwono, S. (2018). CTL learning model in the Millennial Era: The use of Edmodo-based e-learning model on Geography learning in SMA and MA Assalaam. In *Proceedings of the International Conference on Teacher Training and Education 2018 (ICTTE '2018)*. Paris, France: Atlantis Press.

Roblyer, M. D., & Doering, A. H. (2013). *Integrating educational technology into teaching* (6th ed.). Boston, MA: Pearson Education.

Safitri, A. D. (2018). Enhancing senior high school students' creative thinking skills using project-based e-learning. *Journal of Physics: Conference Series*, *1097*(1), 012030.

Satriani, I., Emilia, E., & Gunawan, H. (2012). Contextual teaching and learning approach to teaching writing. *Indonesian Journal of Applied Linguistics*, *2*(1), 10–22. doi:10.17509/ijal.v2i1.70

Shalihah, F., Supramono, S., & Abdullah, A. (2019). Blended learning-based media usage to practice problem solving skills. *European Journal of Education Studies*, *5*(9), 166–172.

Song, Y., & Wen, Y. (2018). Integrating various apps on BYOD (Bring Your Own Device) into seamless inquiry-based learning to enhance primary students' science learning. *Journal of Science Education and Technology*, *27*(2), 165–176. doi:10.100710956-017-9715-z

Šulistová, J. (2013). The content and language integrated learning approach in use. *Acta Technologica Dubnicae*, *3*(2), 47–54. doi:10.1515/atd-2015-0018

Symons, D., & Pierce, R. (2018). Aligning online mathematical problem solving with the Australian curriculum. In *Proceedings of the 41st Annual Conference of the Mathematics Education Research Group of Australasia*. Auckland, Australia: MERGA.

Symons, D., Pierce, R., & Redman, C. (2016). Exploring collaborative online problem solving as opportunity for primary students' development of positive mathematical identity. In *Proceedings of the Annual Conference of the Australian Association for Research in Education*. Canberra, Australia: AARE.

Theodosiou, C. G. (2016). Content and language integrated learning (CLIL): An experimental study on CLIL compatibility with the Modern Greek educational system. *English Review: Journal of English Education*, *4*(2), 149–160.

Thibaut, P. (2015). Social network sites with learning purposes: Exploring new spaces for literacy and learning in the primary classroom. *Australian Journal of Language and Literacy*, *38*(2), 83–94.

Thibaut, P., Curwood, J. S., Carvalho, L., & Simpson, A. (2015). Moving across physical and online spaces: A case study in a blended primary classroom. *Learning, Media and Technology*, *40*(4), 458–479. doi:10.1080/17439884.2014.959971

Thomas, J. W. (2000). *A review of research on project-based learning*. San Rafael, CA: Autodesk Foundation.

Topping, K. J. (2005). Trends in peer learning. *Educational Psychology*, *25*(6), 631–645. doi:10.1080/01443410500345172

Tsiakyroudi, M. (2018). Exploring the effectiveness of Edmodo on Greek EFL B1 learners' motivation to write. *Research Papers in Language Teaching and Learning*, *9*(1), 96–112.

Vania, P. F., Setiawan, W., & Wijaya, A. F. C. (2018). Edmodo as web-based learning to improve student's cognitive and motivation in learning thermal physics. *Journal of Science Learning*, *1*(3), 110–115. doi:10.17509/jsl.v1i3.11796

Végh, V., Nagy, Z. B., Zsigmond, C., & Elbert, G. (2017). The effects of using Edmodo in biology education on students 'attitudes towards biology and ICT. *Problems of Education in the 21st Century, 75*(5), 483-495.

Wardono, W., Mariani, S., Rahayuningsih, R. T., & Winarti, E. R. (2018). Mathematical literacy ability of 9th grade students according to learning styles in Problem Based Learning-Realistic approach with Edmodo. *Unnes Journal of Mathematics Education*, *7*(1), 48–56.

Widyaswara, I. B., Wardono, W., & Asih, T. S. N. (2019). Mathematical literacy ability viewed from student engagement on formulate share listen create model with reciprocal teaching approach assisted by Edmodo. *Unnes Journal of Mathematics Education Research*, *8*(2), 188–194.

Wrahatnolo, T., Wibawa, S. C., & Wahono, A. (2019). The implementation of Edmodo using cooperative learning model in Operating System. In *Proceedings of the Fifth UPI International Conference on Technical and Vocational Education and Training (ICTVET '2018)*. Paris, France: Atlantis Press. 10.2991/ictvet-18.2019.90

Yusuf, Q., Yusuf, Y. Q., Erdiana, N., & Pratama, A. R. (2018). Engaging with Edmodo to teach English writing of narrative texts to EFL students. *Problems of Education in the 21st Century, 76*(3), 333-349.

## KEY TERMS AND DEFINITIONS

**Blended Learning:** A learning approach that is based on the combination of classroom instruction and Internet resources. Its purpose is to combine the advantages of both approaches.

**Cooperative Learning:** A type of learning in which students learn by cooperating and working in groups sharing goals and depending on each other.

**Distance Learning:** A type of learning in which tutors and students are in different locations. It is usually supported by Internet technologies, but this is not always a prerequisite.

**Internet-Based Learning:** A type of learning using Internet-based resources. It may involve individuals or groups of learners.

**Learning Management System:** A system incorporating a suite of e-learning functionalities addressed to students, tutors and administrators. These functionalities involve, among others, creation, delivery and management of content, interaction among users, control, and administration.

**Problem-Based Learning:** A learning approach in which students work in groups and learn by solving open-ended problems. It is a student-centered approach that is based on the active participation of students.

**Social Learning Network:** A social network specifically addressed to education and involving interaction among students, tutors, parents of young students, and learning processes.