

Blended Learning in K-12 Education: A Case Study for Teaching Athletics in Physical Education

Kyriakidis George

Teacher of Physical Education
Ippodromiou 74, Thessaloniki, Greece
gkiriak@sch.gr

Papadakis Spyros

Adjunct Faculty, Open University of Cyprus
Epirou 19, Patras, Greece
papadakis@eap.gr

ABSTRACT

The implementation of blended learning methodologies, founded in the use of the World Wide Web in primary and secondary education, opens new horizons in class management, in designing technology-based courses, and in providing differentiated tutoring as well as personalized support. Blended learning means a merging of activities that happen inside and outside the classroom, but also includes activities that are carried at a distance. In this paper, is investigated as a case study, the effect of implementing a set of lessons using the method of blended learning, on the cognitive level of students of primary and secondary education, in Physical Education (PE) courses. The lessons were designed based on the goals of the course in the subject of athletics and were introduced into the school's hourly scheduled time for the course. In relation to the matter of distance mentioned above, as well as learning through the use of technology, four sequences of learning activities were developed using the Learning Management System (LMS) LAMS (Learning Activity Management System), which operated in integration with LMS Moodle. The theoretical framework, the methods of teaching and assessment that were applied as well as the tools that were used for sequence development are described. Their implementation was in accordance with the school's schedule. The results showed a statistically significant case for blended learning, compared to traditional teaching.

Author Keywords

Blended Learning, K-12 Education, Physical Education, Athletics, Moodle, LAMS

INTRODUCTION

Blended teaching and learning seeks to merge selectively –to a larger or greater extent – various methods of teaching and learning, methodologies, educational approaches and teaching practices, depending on the needs of each learning group or team, so that the best possible result can be achieved. The combination of face-to-face teaching with the opportunities given by educational technologies is a relatively new model which has not been adequately researched as to its advantages and level of effectiveness in primary and secondary education.

This paper centres on this specific axis. With the use of new technologies, a set of lessons was created using the methods of blended learning, and was applied as a case study to students in primary and secondary education, in the school subject of athletics, and within the framework of the course's timetabled school implementation. The online aspect of the course was covered with the development of four learning activities, using LAMS, which worked in tandem with the LMS known as Moodle.

The choice of the field of application was made with regard to the rise of a sedentary lifestyle and a decrease in physical activity noted in the last decades, which factors have increased the number of teenagers that can be classified as overweight or obese, traits which follow them into their adult lives. The treatment of the problem requires – alongside other things – actions which will promote physical activity and will lead the students to take a positive stance towards athletics and sport for their entire lives. One of these actions is the promotion of the physical education course in primary and secondary education (Janssen et al., 2005).

More specifically, and further, this study looks into the extent to which blended learning lessons can improve the cognitive level of students, as compared to traditional teaching. The lessons were implemented with learners in the last year of primary school (year 6) and in the three years of lower secondary (junior high school), within the framework of their physical education lessons.

The results showed that lessons involving blended learning methods significantly improved the cognitive level of students, in comparison with traditional, conventional teaching.

BLENDING LEARNING

The term blended learning by its nature refers to something very general. Terms such as hybrid learning are also frequently used. In the past these terms were used in cases in which face-to-face teaching was mixed with newly presented and evolving methods, with or without the use of new technologies. An example of this is traditional teaching combined with web-based learning or constructivist-behavioural teaching methods (Graham, 2006). Blended learning arose from a need to expand traditional anthropocentric classes in time and in space, using new tools. This is achieved by the use of any new media form, incorporating these in teaching to serve such goals as have been set (Bersin, 2004).

Today, when using the term blended learning, we mean the combination of learning through the internet and digital media within established class structures which require the physical presence of teacher and students (Friesen, 2012). With the above in mind, it becomes clear that the possible combinations are endless. What will be chosen to be blended with traditional learning techniques? How?

An attempt at categorizing blended learning was made by the Innosite institute, which led to the taxonomy of four models of blended learning, stressing that these too are constantly evolving (Staker & Horn, 2012). In brief they are:

1. **The rotational model**, in which the students within a course or subject 'rotate' around different teaching practices, one of which is learning via the internet with a fixed program, set at the discretion of the teacher, within the school premises.
2. **The flex model**, in which the learning content is offered mainly through the internet. The program is adjusted in accordance with the needs that emerge, with the teacher offering guidance to groups or to single students wherever needed.
3. **The self-blend model**, where the student chooses by himself one or more web-based lessons to support traditional teaching. This occurs within or away from the learning establishment's premises, without the physical presence of a teacher.
4. **The enriched-virtual model**, in which the lessons are conducted online, with supplementary inter-spaced lessons with physical presence in a learning establishment.

As it may be apparent, from the above four models, the first two are considered the most appropriate for primary and secondary education, due to the constant physical presence of the teacher, while the other two are more suitable for higher levels of education.

Blended learning and traditional teaching

The creation of blended learning lessons is by nature complex. What makes this kind of learning attractive, though, is the ability to create learning communities, with practically limitless web resources, open and rapid communication, and an exchange of opinions (Garrison & Kanuka, 2004). It can overcome passivity, a trait that often characterizes traditional teaching/learning. Web conferencing and lessons encourage students to participate actively, reducing the chances of their developing a passive stance. This is the conclusion of a study where the blended learning group of students yielded better learning results than the traditional teaching group (Chen & Jones, 2007). In another study, not only was an increase in performance noted, but also an increase in satisfaction among the blended learning group and its teachers (Melton, Bland, & Chopak-Foss, 2009).

PHYSICAL EDUCATION AND ICT

The current paper could not have been realized if there was no previous literature on the effect of Information and Communication Technologies (ICT) on the subject of PE.

The bibliography and research shows that ICT can contribute to the achievement of a PE course's goals individually and as a whole. The PE teaching community has a positive stance towards the implementation of ICT in their lessons, recognizing its positive contribution (Thomas & Stratton, 2006), particularly when lesson design features educational strategies (Thornburg & Hill, 2004).

The use of new technologies in physical education can work as an enhancer and improve student performance, particularly in themes of an academic nature (Siskos, Antoniou, Papaioannou, & Laparidis, 2005). Without these technologies being a replacement for traditional teaching, they can however make the lesson more attractive (Ciolcă & Vasiliu, 2013), while the introduction of modern audiovisual material into PE can prompt an interest for learning in students, increase their enthusiasm and improve the quality of the lesson. The scientific accuracy of teaching is also reinforced, helping teachers more easily to emphasize the main points, thus saving time. Students also become the center of the teaching process, and are transformed from passive receivers into active learners (Deng & Hu, 2014). Motivation to participate is increased, while at the same time their performance in motor activities may also show improvement (Liu, 2012).

In one study, after a series of lessons was taught using multimedia, the test group fared better than the control group in the psychokinetic aspect of volleyball (Wilkinson, Hillier, Padfield, & Harrison, 1999), while similar results were presented in another study concerning a track and field event, the triple jump (Wong, Shariffudin, Mislán, & Julia Guan, 2011). In another study, of a lesson created for the LMS Moodle on table tennis, an increase in both game knowledge and game performance was noted (Zou, Liu, & Yang, 2012).

Blended learning and physical education

As the bibliography and research shows, the results concerning blended learning and PE, while positive, are limited. This is to be expected, since the use of new technologies in PE is not widespread (Siskos & Antoniou, 2006).

In a study on basketball shots, the team that followed a blended learning method scored the most, compared to two other teams which had followed a traditional method and a method involving only multimedia, respectively (Vernadakis,

Andoniou, Zetou, & Kioumourtzoglou, 2004), while the best results were seen in a team of students who had attended a blended learning PE course, compared to the traditional learning group (Vernadakis, Giannousi, Derri, Michalopoulos, & Kioumourtzoglou, 2012).

BLENDLED LEARNING LESSONS IN ATHLETICS

In the belief that blended learning can be applied to PE, a series of blended learning lessons were created on the subject of athletics. For the online aspect of the lessons, four sequences of learning activities were created using LMS. The usage of LMS offers opportunities for sharing, reusing and altering the content, and it can be used by teachers who do not have significant ICT knowledge (Chou & Chou, 2011).

LAMS is free open source software (FOSS) which provides tools for designing, managing and distributing co-operative learning sequences via the internet, without excluding personal approaches. Through an accessible graphic user interface (GUI), the teacher can create lesson plans using flow charts. It offers communication and supervision tools, and can work autonomously or in co-operation with another LMS. LAMS's work environment (Image 1), makes extensive use of the "drag & drop" function, and after an initial lesson plan is created, the teacher can then 'fill in' each activity with the needed material. Changes in the lesson's flow, as well as the removal or addition of material and activities, can be performed during the execution of the plan itself. The emphasis which is given to student-teacher interaction becomes apparent from the above observations, a fact which differentiates LAMS from other LMS programs, which mostly accentuate the content (Papadakis, 2010).

Lessons created using LAMS can be imported and exported as .zip files which will contain all the resources, thus making the process of transfer and distribution easy.

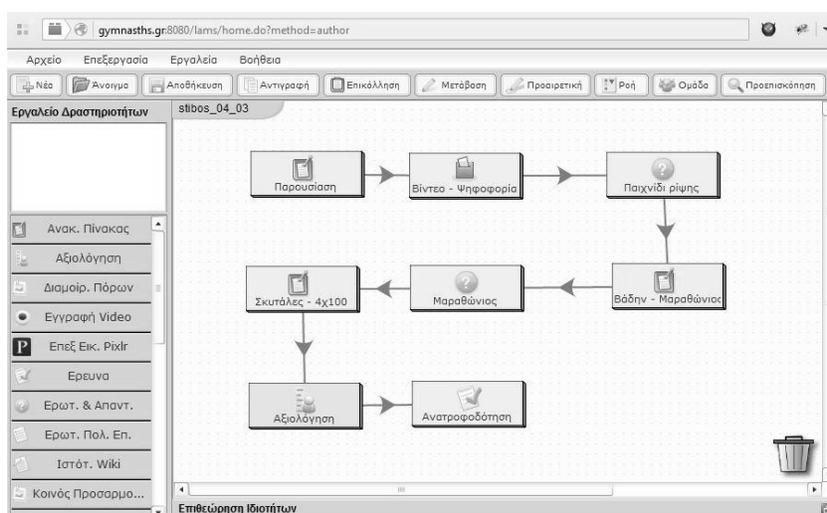


Image 1: LAMS's visual authoring environment.

Blended learning model

The blended learning model which was considered appropriate for this particular research, and which was consequently used, was the rotational model, in which the class rotated between the school's computer lab for the online aspect and the open field, where physical activities took place.

Goals

The lessons were designed and driven with the main goals of the PE course in mind, as these goals are described in the curricula for the last year of primary and the first three years of high school, concerning the subject of athletics. They are as follows:

1. **Cognitive:** The students should be able to describe the basic techniques and recognize the different categories of athletic events. They should learn the essential rules of such events, and gain a sense of real-world performance.
2. **Emotional:** Development of a positive stance towards exercise and sport, reinforcing concepts of sportsmanship and healthy competition, recognizing the role of sport in people's social life, dedication to goals, and the development of critical thinking.
3. **Social:** For students to co-operate with each other and work in teams, to build interpersonal relationships, and to be accepting of different opinions.
4. **Psychomotor:** To be able to remember kinetic models presented, and so to improve technical execution during kinetic exercises.

In particular, for the digital part, the creation of activities about sections that are difficult for the PE teacher to fully develop during traditional teaching was emphasized. Namely:

1. Detailed explanation of athletics sports technique. This was done with appropriate videos featuring highly proficient athletes who compete in international events. Thus the students would come into touch with the correct kinetic model.
2. The place of commission and the technological equipment required for various events. An example of this is the students learning about “photo-finish” and its uses in running events for the final ranking, through appropriate presentations and video.
3. Sportsmanship, healthy competition and the promotion of peace, brotherhood, understanding and acceptance through sport. Through case study activities, the students would learn to study real cases in the realm of sport. Discussion would follow, so that they could analyse these and arrive at conclusions.
4. Historical information and findings, moments from great sporting occasions, perception of the importance of the public who surround athletics and its competitions.

Teaching techniques

Some take the view that in the implementation of blended learning, insufficient attention has been paid to educational theories and pedagogical methodologies (Chew, Jones, & Turner, 2008). In this study, several up-to-date teaching strategies were deployed, emphasizing social constructivism, such as:

1. **Work groups:** lessons are so constructed that they may be carried out by groups, when the number of computers is insufficient for individual work
2. **Brainstorming:** through presentation of the theme and suitable questioning, learners are given the opportunity freely to express their ideas and to form their own answers. Following this, all views are presented to all the learners, so that they can explain their answers, comparing these with others, enabling them to see the matter from many sides, thus enriching their knowledge. This technique sets thought free, while reinforcing both creativity and critical thinking.
3. **Research:** at various lesson stages, learners are requested to carry out small research studies.
4. **Presentations:** Presentations using the Prezi tool, avoid the passivity of simple presentations. The learner is in control; entering and exploring the content, he or she may discover new knowledge.
5. **Case study:** material relating to a specific real occurrence is presented to the learners. Then they are called on to comment on it, on the basis of the theme which is set, with any necessary clarifications. Learners set down then present their views. This system allows the open expression of all views. Later, conclusions about these views are reached through discussion.
6. **Discussion:** the teacher sets out a theme and the learners begin a discussion, with the aim of exploring and approaching it from many sides.
7. **Learning through play:** games are used, through which skills and knowledge, related to the aims of the course, are developed.

Assessment

In the assessment sector for the online part, there are two relevant activities in each activity sequence. 1) A self- evaluation questionnaire for the learners aimed at the particular area of knowledge, with no obvious grades or marks, with questions of various types and the opportunity to correct or refine the questions. 2) A feedback activity in which learners describe the lesson in terms of level of difficulty and may make comments, observations and suggestions. This enables the teacher to find out what the learners thought of the lesson.

However, the principle assessment of the lesson is based on the Learner Portfolio. Through LAMS, there is the possibility of uploading a compressed .zip file which contains, in web-page form, all the work produced by the learners, such as their views and approaches to themes as well as their conclusions, including statistics from questionnaires and from feedback, giving an overall picture of the level and quality of the lesson.

METHODOLOGY

In the present study, 68 learners in total took part, of whom 47 were in the final year of primary education (11 years of age) and 21 were drawn from all the three years of lower secondary (junior high school: 12, 13 and 14 years of age). Two physical education teachers took part, from two schools, one primary and one junior high. The learners were divided into two groups, one experimental with 37 learners, and a control group with 31 learners.

Firstly, all the learners filled in an online questionnaire to diagnose their level of knowledge of athletics; this was designed and implemented using Moodle. The questionnaire consisted of 20 questions of various types and was drawn up by two PE teachers specialized in athletics. The evaluation scale was from 0 – 100.

Subsequently, the experimental group underwent a programme of rotational blended learning, in rotation in the school's computer lab and in the space assigned for physical activities (lab rotational model). During the online part, the learners carried out four successive learning activities during as many visits to the computer lab. This online part was carried out on an information system that consisted of Moodle and LAMS, integrated within a unified environment in which LAMS functioned as a Moodle client (Image 2).

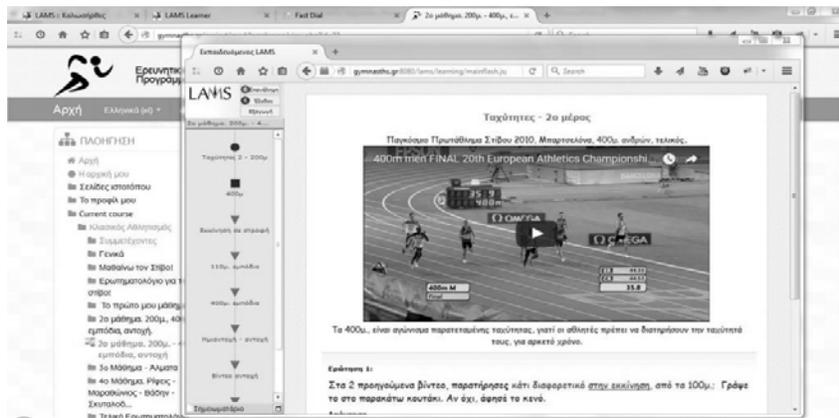


Image 2. LAMS's learner environment, within Moodle.

The teacher gave guidance, intervening at need either with groups or with individuals, emphasizing those parts of the lesson he judged to be essential. All these actions, took place mainly through the monitoring environment of LAMS which enables the tracking of student progress (Image 3). The control group followed a traditional teaching programme.

Finally, all the learners completed the questionnaire for a second time, so as to reveal any differences. The whole procedure lasted two months.

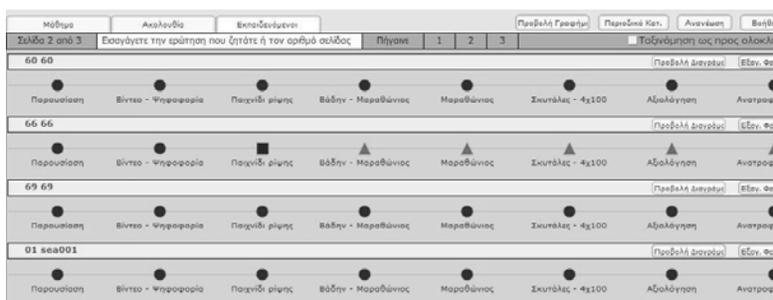


Image 3. The monitoring environment.

RESULTS

The sample was found to follow a normal distribution, applying the Kolmogorov - Smirnov method ($p=0.200$). To find out whether there was a statistically significant difference in both groups after the implementation of the lessons, the t-test for paired samples was used. Table 1 shows the results for the control group. We observed that learning took place ($p<0.05$) with traditional teaching.

Paired Samples Test – Control Group					
Pair	Mean	Std. Deviation	95% Confidence interval of difference		Sig. (2-tailed)
			Lower	Upper	
Pretest - Posttest	19,935	12,280	15,431	24,440	,000

Table 1. Paired Samples t Test for Control Group.

The same observation was made for the experimental group ($p=0.05$), that is, learning was also observed after the application of blended learning (Table 2).

Paired Samples Test – Experimental Group					
Pair	Mean	Std. Deviation	95% Confidence interval of difference		Sig. (2-tailed)
			Lower	Upper	
Pretest - Posttest	34,000	15,422	28,858	39,142	,000

Table 2. Paired Samples t test for Experimental Group.

In order to discover whether there was any statistically significant difference between the two groups, the method of Welch and Brown-Forsythe was used to analyze the one-way variation between paired observations (ANOVA), as seen in Table 3.

One Way ANOVA	
	Sig.
Pretest between groups	,213
Posttest between groups	,000

Table 3. One way ANOVA test between experimental and control groups.

In the initial test, as expected, no significant difference between the groups was found ($p>0.05$). In the final test, however, we can see a statistically significant difference between the experimental and control groups ($p<0.05$). This is also demonstrated in Table 4, by the Welch and Brown-Forsythe test.

Brown-Forsythe test		
		Sig.
Pretest between groups	Welch	,216
	Brown - Forsythe	,216
Posttest between groups	Welch	,000
	Brown - Forsythe	,000

Table 4. The Brown-Forsythe test.

As may be seen, in the initial test there is no statistically significant difference in the completion of the questionnaire ($p>0.05$), while the opposite occurs after the application of the two teaching methods ($p<0.05$).

The difference in score between the two groups is shown clearly in the following charts.

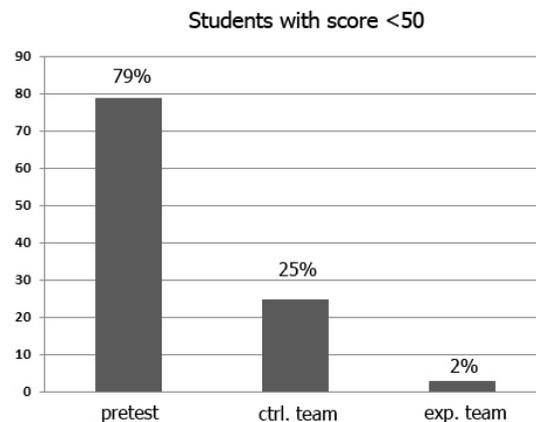


Chart 1: Students with score lower than 50.

In the initial test, 79% of all the students, scored below 50, a relatively low score due to the lack of knowledge about the subject. After the lessons, 25% of the control team and only 2% of the experimental team, scored below 50.

The results from the upper scale, were similar (Chart 2).

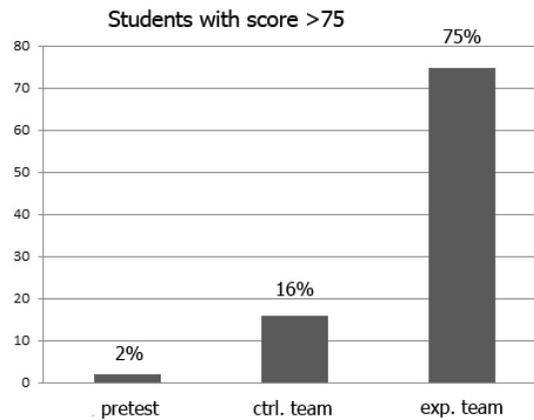


Chart 2: Students with score greater than 75.

In the initial test, before the lessons, only 2% of all the students scored greater than 75. After the implementation of the lessons, 16% of the control team scored over 75, compared to the 75% of the experimental team.

CONCLUSIONS

The results of this study show a clear difference in favour of blended learning in the cognitive area, in the subject of athletics. These results are in accord with those of other studies which also conclude that the implementation of blended learning gives better results than traditional teaching.

As the existing literature is rather sparse, further investigation is needed in other areas, such as the psychomotor and the social.

In general, we consider that the nature of physical education as a school subject now entails the use of blended learning. We consider that the aspect of the subject that has to do with education, with cognition, may greatly benefit from suitably devised blended learning courses, in such a way as also to reinforce its other aspect, that of physical activity. Future research should tend in this direction before arriving at more generalizable conclusions.

In continuation, we intend to extend our research on a larger scale, to broaden its scope into other areas of physical education and into other fields of knowledge.

REFERENCES

- Bersin, J. (2004). *The blended learning book: Best practices, proven methodologies, and lessons learned*: John Wiley & Sons.
- Chen, C. C., & Jones, K. T. (2007). Blended Learning vs. Traditional Classroom Settings: Assessing Effectiveness and Student Perceptions in an MBA Accounting Course. *Journal of Educators Online*, 4(1), n1.
- Chew, E., Jones, N., & Turner, D. (2008). Critical review of the blended learning models based on Maslow's and Vygotsky's educational theory Hybrid learning and education (pp. 40-53): Springer.
- Chou, A. Y., & Chou, D. C. (2011). Course management systems and blended learning: An innovative learning approach. *Decision Sciences Journal of Innovative Education*, 9(3), 463-484.
- Ciolcă, C., & Vasiliu, A.-M. (2013). Advantages and disadvantages of continuous training for athletes in e-learning system. Paper presented at the Conference proceedings of "eLearning and Software for Education"(eLSE).
- Deng, Z., & Hu, Q. (2014). Efficient Physical Education Method Based on Multimedia Technology. Paper presented at the 2012 International Conference on Cybernetics and Informatics.
- Friesen, N. (2012). Report: Defining blended learning.
- Garrison, D. R., & Kanuka, H. (2004). Blended learning: Uncovering its transformative potential in higher education. *The internet and higher education*, 7(2), 95-105.
- Graham, C. R. (2006). Blended learning systems. CJ Bonk & CR Graham, *The handbook of blended learning: Global perspectives, local designs*. Pfeiffer.
- Janssen, I., Katzmarzyk, P. T., Boyce, W. F., Vereecken, C., Mulvihill, C., Roberts, C., . . . Pickett, W. (2005). Comparison of overweight and obesity prevalence in school-aged youth from 34 countries and their relationships with physical activity and dietary patterns. *Obesity reviews*, 6(2), 123-132.
- Liu, M. C. (2012). Influence of Multimedia Communication Materials on the Students' Sports Motivation. Paper presented at the Applied Mechanics and Materials.

- Melton, B. F., Bland, H. W., & Chopak-Foss, J. (2009). Achievement and satisfaction in blended learning versus traditional general health course designs. *International Journal for the Scholarship of Teaching and Learning*, 3(1), 26.
- Papadakis, S. (2010). Online educational resource development: supporting the educator Hellenic Open University. Patra. Retrieved from <http://www.didaktorika.gr/eadd/handle/10442/26260>
- Siskos, A., & Antoniou, P. (2006). New Technologies and Teaching Physical Education. *Inquiries in Sport & Physical Education*, 4(2), 311-325.
- Siskos, A., Antoniou, P., Papaioannou, A., & Laparidis, K. (2005). Effects of multimedia computer-assisted instruction (MCAI) on academic achievement in physical education of Greek primary students. *Interactive Educational Multimedia*(10), 61-77.
- Staker, H., & Horn, M. B. (2012). *Classifying K-12 Blended Learning*. Innosight Institute.
- Thomas, A., & Stratton, G. (2006). What we are really doing with ICT in physical education: a national audit of equipment, use, teacher attitudes, support, and training. *British Journal of Educational Technology*, 37(4), 617-632.
- Thornburg, R., & Hill, K. (2004). Using internet assessment tools for health and physical education instruction. *TechTrends*, 48(6), 53-55.
- Vernadakis, N., Andoniou, P., Zetou, E., & Kioumourtzoglou, E. (2004). Comparison of three different instructional methods on teaching the skill of shooting in basketball. *Journal of Human Movement Studies*, 46, 421-440.
- Vernadakis, N., Giannousi, M., Derri, V., Michalopoulos, M., & Kioumourtzoglou, E. (2012). The impact of blended and traditional instruction in students' performance. *Procedia Technology*, 1, 439-443.
- Wilkinson, C., Hillier, R., Padfield, G., & Harrison, J. (1999). The effects of volleyball software on female junior high school students' volleyball performance. *Physical Educator*, 56(4), 202.
- Wong, C., Shariffudin, R., Mislán, N., & Julia Guan, C. (2011). The Effects of E-Sports Courseware for Teaching Psychomotor Skills. Paper presented at the 5th International Conference on Distance Learning and Education, International Proceedings of Computer Science and Information Technology.
- Zou, J., Liu, Q., & Yang, Z. (2012). Development of a Moodle course for schoolchildren's table tennis learning based on Competence Motivation Theory: Its effectiveness in comparison to traditional training method. *Computers & Education*, 59(2), 294-303.