

POSSIBILITIES FOR APPLYING AN INTEGRATIVE APPROACH IN TANDEM TEACHING-LEARNING MATHEMATICS THROUGH MOBILE GAMES IN PHYSICAL AND HEALTH EDUCATION CLASSES¹

Example from teaching practice

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INTRODUCTION

The need for an integrative-correlational approach in teaching

The integrative-correlational approach is a modern model of organizing teaching that emphasizes the connection between different subjects, content, and activities. Instead of presenting knowledge in isolation, this approach creates opportunities for pupils to connect concepts, see interrelationships, and develop a deeper, more complex understanding of phenomena through multiple perspectives and recognize the interconnections between different disciplines.

Implementing integration and correlation in the teaching process brings many advantages. It is precisely by applying correlation and integration in teaching that optimal learning is achieved. Integrated teaching, interdisciplinary teaching, holistic teaching, correlation, thematic teaching, etc. are just "attempts to connect the knowledge of the student's learning process from different disciplines into a whole that explains a certain phenomenon, concept, thought or topic" (Čudina Obradović and Brajković, 2009; according to Mikulec, 2022, p. 16). This approach enables pupils to view the world holistically and understand the practical value of the knowledge they have acquired.

The task of the integration-correlation system is to develop the ability to observe and discover a creative approach to the topic being studied, develop imagination and creativity, discover which elements are common and which are different in the content being studied, and develop the ability for logical and critical thinking and reasoning (Salopek, 2012).

Correlation, like integration, allows pupils to easily assimilate the acquired knowledge. Correlation of content allows problems to be solved through multiple perspectives, which is crucial for real life and professional development.

In teaching, in addition to integration and correlation of the lesson itself, an **integrated day** can be organized and implemented. On that day, the content from multiple subjects is integrated around a common theme or teaching unit. The duration of this way of working is determined by monitoring the activity and interest of pupils, depending on the content (Matijašević & Matijašević, 2020, p.5).

The integrative-correlational approach to teaching can also be realized through: project teaching, interdisciplinary workshops, research activities, problem-based tasks, practical experiments, and other interactive forms. This way of working creates a

dynamic classroom in which pupils are active participants, and learning is experiential, meaningful, and authentic.

In this way, children are provided with an analytical approach to the acquisition of certain concepts and phenomena. The possibility of forming a complete picture of a problem or phenomenon that is being studied in the classroom also means organizing the teaching with the help of subject-lesson correlation where related subjects are connected in a common theme. Correlation in teaching would mean functionally connecting the content elements of different subjects, or different subject units, in order to establish real connections and relationships between them (Poljak, 1965, 158; Skupnjak, 2009).

Due to its specificities, classroom teaching is most suitable for implementing integrated teaching. The classroom teacher is familiar with the curricula and programs of a range of subjects, and therefore can more easily take advantage of the opportunities for their integration. Namely, a teacher who plans and controls the learning and study of multiple different subjects can easily align topics and content throughout their monthly or daily lesson planning.

In subject teaching, correlation is more difficult to perform, but that does not mean it is impossible, it just requires good team planning and effort (Skupnjak, 2009, according to Mikulec, 2022, p. 17).

Implementing correlation in the teaching process is not a simple process, but requires preparation. In order for the connection to be successful, certain prerequisites need to be met. Teachers must possess the necessary competencies, innovation and expertise, but also be motivated for such a way of working. When applying this approach in teaching, the teacher moves from the position of a "transmitter of knowledge" to the role of an organizer, motivator, guide and mentor. This contributes to more effective, dynamic and modern teaching.

At the same time, the separation that seemingly prevails in subjects, but also between teachers, needs to be overcome (especially noticeable in the inter-subject correlation in subject teaching). Teachers should recognize the connection between subjects, i.e. areas. In doing so, it is important to take into account the psychological foundations of the correlation and integration of program content, which are conditioned by the age, development of thinking, reasoning, abilities and interests of pupils (Nad Olajoš, 2016, p.29).

¹Activity/workshop realized within the framework of The 27-th Symposium for Sport and Physical Education of Youth and 19-th International Scientific Conference Ohrid, hotel "Aqvalina", 16th – 17th May, 2025

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Learning Mathematics Through Movement

Every child has an intrinsic motivation to learn, and the task of every teacher is to create conditions for awakening and stimulating this ability in pupils. When they are in primary education, children are motorically and emotionally active to a much greater extent than intellectually, so the teacher should try to find ways to stimulate their will through the medium that is closest and most familiar to them, which is play and movement. Movement is a natural medium for children's learning, especially in primary education, and as such should be used as much as possible.

Generally, most pupils perceive mathematics as the most difficult school subject, and teaching this subject is repulsive to them. Hence, the role of the teacher is significant, who needs to find a way to bring mathematical content closer to the pupils and for them to be easily and understandably accepted and adopted by the pupils. This can be done most easily through play and game activities.

Active mathematics is moving mathematics, and moving mathematics is fun mathematics. It is exact, with clearly defined rules that apply equally to everyone. There is no confusion in it, no ambiguity or ambiguity in it and as such it instills confidence and a sense of security in its pupils. The task of the teacher would be to make the teaching of mathematics "alive", interesting and moving. By learning mathematics, they will gain confidence and security in the use of numbers and will develop skills in measurement, constitution and spatial area. They will learn to collect, organize and interpret data, to use mathematical language and representations, to generalize from observed regularities. and connection - to think abstractly. They will become active participants in the learning process and so on to become capable of lifelong learning.

Through this approach, pupils are encouraged to view the problem from multiple angles, logical thinking is encouraged among pupils, opportunities for including multiple thought operations in the acquisition of the concept/problem are encouraged, curiosity is encouraged, knowledge becomes more permanent, and satisfaction with the acquired knowledge increases.

The teaching process in the Republic of N.Macedonia and the possibilities for applying integration-correlation approach in teaching

Between subject-specific connections of content, integration and correlation, i.e. the interdisciplinary approach in teaching has a single goal: to enable the student to permanently acquire knowledge and skills and their application in everyday life.

The new concept for primary education (Concept for Primary Education, 2021) recognizes the need for changes based on new knowledge for the development of quality education, on global and European trends for competence-based education, on the digitalization of education, as well as on all our previous experiences and aspirations to improve the quality of teaching and learning in our schools, which should become a place for learning and development of motivated pupils ready to acquire the expected competencies. The new concept for primary education offers changes in several areas related to the integration of teaching and subjects, the choice of subjects of interest to the student, learning through research and projects, reducing the burden of teaching materials with factual data, adapting teaching to the needs of all pupils, using a variety of teaching materials, active participation of pupils in school life, cooperation and professional development of

teachers and their motivation through career development, thus enabling the possibility of building a school tailored to the needs of children.

A novelty of the new Concept for Primary Education is the definition of national standards for student achievements that determine the competencies that pupils should acquire at the end of primary education.

Tandem teaching and its possibilities

With the amendments to the Law on Primary Education (2019), tandem teaching has been introduced into the teaching process in our country, where the subject Physical and Health Education is organized and implemented in tandem between class teachers and subject teachers. *The Guidelines for Planning, Organization and Implementation of Teaching from Grades 1 to 6²*, issued by the Bureau for the Development of Education, provide guidelines for implementing the subject Physical and Health Education from Grades 1 to 5.

The contents studied in the subject Physical and Health Education in the first cycle of primary education represent the basis for a healthy lifestyle, so that through the application of various physical exercises, movements, games or through other contents, first of all, the health of pupils is improved, both mentally and physically, various forms of movement are adopted, and all of this has a positive impact on the overall development of all domains (motor, cognitive, socio-emotional). When it comes to the integration-correlation approach, this subject offers opportunities for establishing such relationships with other subjects, especially mathematics, natural sciences, society, and music.

This teaching model, among other things, offers the opportunity for practical application of the integration-correlation approach in teaching. The simultaneous presence of the class and subject teacher in the HIF classes allows pupils to thematically connect the teaching content of HIF with other teaching subjects with which they have some connection, in order to form a content-functional connection between existing and new knowledge, to increase the degree of permanence of knowledge, and to be able to effectively apply that knowledge and skills in everyday life.

Taking into account the advantages of the integration-correlation approach in teaching and the opportunities and benefits offered by tandem teaching, within the framework of the 27th Symposium on Sports and Physical Education of Youth and the 19th International Scientific and Professional Conference organized by the Federation of Sports Pedagogues of the Republic of Macedonia and Sofia University - Department of Sports, in the period from May 16-17, 2025, a workshop entitled: "Holistic learning through Physical Education - Learning math's through movement games at PE classes" was held.

Practical activities within the workshop³

The workshop was implemented by Prof. PhD. Despina Sivevska, Faculty of Educational Sciences, UGD - Shtip and Jugoslav Spasic, teacher of PHE in tandem teaching at the Primary School "Krste Misirkov" - Kumanovo. The aim was to develop and explain the possibilities of how the integration-correlation approach can be achieved/implemented through tandem teaching, with a special emphasis on connecting the teaching content of mathematics and PHE in the classes in grade school in the first developmental period.

The workshop included teachers from the following primary schools in the Republic of Macedonia: Primary School

² Guidelines for planning, organization and implementation of teaching from 1st to 6th grade in primary education in the 2023/24 school year, Ministry of Education and Science, Bureau for Educational Development

³ Link to the activities carried out within the framework of the Conference:
<https://www.facebook.com/FederationOfSportsPedagogue>

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Goce Delchev, Primary School Dimkata Angelov Gaberot, Primary School Strasho Pindzur, Primary School Tosho Velkov Pepeto, Secondary School Dobre Daskalov from Kavadarci; Primary School Panko Brashnarov, Primary School Cyril and Methodius, Primary School Blaze Koneski from Veles; Primary School Vancho Prke from Shtip and Primary School Pere Toshev – Rosoman. A total of 12 classroom and 30 subject teachers in the field of health education (involved in the implementation of tandem teaching) were involved.

The workshop began with relaxing and motivating activities that allowed the participants to get to know each other better and at the same time create a positive working atmosphere.

Materials for work

Each group was given a curriculum for mathematics and PHE from the first developmental period (first to third grade). The division was aimed at showing different models of lessons for each grade separately (first to third) through which tandem teaching can be realized, emphasizing the possibility of correlation of contents from the PHE and mathematic subjects.

Visual aids/props for realizing the activity/lesson: Flip chart, colored markers, soft balls, small balls, hoops, cones, cornets, ropes, vertical racks, colored markers as a jersey for forming groups, cups, floor ladders and jumping bags.

Form of work: frontal and group

Method of work: working with text, game, illustrative-demonstrative method

Course of the activity

The teachers were divided into groups, a total of 3 (three), on the principle that each group should have an equal representation of class and subject teachers, in order to be able to implement tandem teaching, that is, to be able to jointly prepare for a lesson on PHE by connecting it with mathematics content.

Each group was obliged to choose a leader from among the class teachers, who, together with the subject teacher, would explain/demonstrate the lesson model.

Activity 1:

In order to introduce the practical activity, each group was asked to think about and answer the following problem challenges:

- What is meant by integration and correlation, a brief explanation and an attempt to define the terms?
- What is the role of the class teacher in tandem teaching?
- What is the role of the subject teacher (according to the PHE) in tandem teaching?
- Game - can and how can we apply the game in teaching?
- What do you mean by the application of the holistic approach in teaching?

Duration of the activity: 20-25 min.

Each group independently answered the problem questions, using a flipchart on which it listed the answers. The group leader presented the answers.



After the presentation of each group's responses, the workshop leaders explained through short lectures the terms on which the participants had previously shared their opinions.



Reflection: From what was presented, we could conclude that the majority of teachers do not understand the terminology of the concepts of correlation, integration, integrative-correlational approach to teaching, holistic approach to teaching and its respect in teaching, as well as partial recognition of the roles of the classroom and subject teacher in tandem teaching.

Activity 2:

Each group was tasked, through an analysis of the mathematics and PHE curricula for the appropriate grade (from first to third), to find content through which tandem teaching could be implemented in a PHE lesson, with the possibility of connecting the content of the two subjects. In doing so, a lesson scenario was planned, which would clearly state the standards to be achieved, the course of the activity, as well as the roles of the class and subject teacher during the lesson.

For 15-20 minutes, each group worked on planning a lesson scenario. This was followed by a practical implementation

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of the planned activity. The lesson was implemented by the class teacher (previously selected leader) and the PHE subject teacher. The remaining group members played the role of pupils. During the lesson simulation, the roles of the class and subject teacher in tandem teaching were clearly specified.



Reflection: Each of the groups, through an analysis of the curricula, managed to select content from the PHE curriculum through which a correlation can be made with the content of the mathematics subject. The preparation (lesson scenario) of each of the groups was successfully planned, stating the necessary standards, lesson objectives and appropriate activities to achieve the set standards. Through the implementation of practical activities, each of the groups managed to successfully apply the integration-correlation approach in teaching by taking advantage of the opportunities offered by tandem teaching.

The presented lesson models (both preparations and practical implementations) achieved the set goal of the workshop. We managed to show that through good and continuous cooperation between the class and subject teacher (within the tandem) it is easy to correlate the teaching content according to the PHE and the other content that is studied within the framework of the classroom teaching for the appropriate grade.

At the same time, it is important to emphasize the positive socio-emotional atmosphere that prevailed during the implementation/simulation of the lessons. Among the participants/pupils, there was a positive working climate, a competitive spirit, encouragement of friendship, and strengthening of their social relationships.

In addition, the knowledge they acquired was more interesting, related/correlated with the contents they study in mathematics. Through games and mobile activities, the concepts of 2D shapes, length measurement and counting within the second ten were processed in correlation with appropriate contents according the Physical and health education (rhythmic games, basic movements in athletics and gymnastics such as walking, running, jumping, hopping, throwing, i.e., climbing, descending, turning over, as well as carrying, transferring, passing, catching and elementary games).



CONCLUSION

The application of a well-thought-out integrative approach in the teaching process, and especially in tandem teaching classes, can be a successful step away from the classical, sometimes rigid subject-lesson system. It is important to respect the laws of child development and to establish new quality relationships in the triangle: student, teacher, teaching material.

For the successful application of the integrative approach in tandem teaching, the most important thing is the readiness of teachers, both in class and in subject areas, for mutual cooperation, shared responsibility and cooperation at the level of professional assets. Starting from global planning, with the joint allocation of content where the integrative approach can be applied, the allocation of common standards, up to the daily preparation/lesson scenario where the team will plan and implement the lesson. In doing so, it is important to determine precisely those topics and teaching content where the integrative approach can be applied and to create favorable conditions for thinking and creative activity among pupils.

The conclusions from the conducted workshop indicate that additional theoretical expansion and deepening of teachers' knowledge about the application of the integrative-correlation approach in teaching are needed, especially regarding tandem lessons, in order to fully utilize the benefits of this approach in the instructional process. All of this may also contribute to raising teachers' awareness about implementing this approach in teaching, as well as encouraging planning and preparation for its application—from the stage of global planning to the concrete daily realization of the teaching content.

Through the implementation of such lessons, it became evident that mathematics can be applied beyond the math class itself. Pupils realize that mathematics is indeed useful to them, that it can be connected to every aspect of the subjects studied in

school—specifically with the contents of PHE—and that the question “What will this benefit me in life?” becomes meaningless in this context.

This way of thinking can be overcome by following and implementing this type of class in which the integrative approach prevails, and where both the class teacher and the subject teacher can jointly plan and carry out the lesson within the framework of tandem teaching. In this way, pupils feel more relaxed during the class and unconsciously engage in mental activities, reason logically, and transfer the acquired knowledge and experience into a different context while learning mathematics. Through this integrative approach, pupils are often unaware that during the class they are both learning and improving their competencies in two different subjects, while the teaching process itself becomes more interesting for them.

By adopting the teaching content through the presented examples, we attempted to highlight the possibilities for studying curriculum topics through interdisciplinary integration, in an environment in which pupils find themselves every day, which makes mathematics gain importance in the lives of pupils, while physical and health education becomes more interesting and attractive.

There is almost no thematic unit in the programs for educational activity in all teaching areas for which integrative-relational connections cannot be established. These connections serve as invaluable sources for knowledge, research, and play. Their application and implementation depend solely on the openness of the teaching process toward such an approach, as well as on the creativity and willingness of teachers—their enthusiasm, motivation, curiosity, creative spirit, and above all, their love for the child.

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