

IOSUD – „DUNĂREA DE JOS” UNIVERSITY OF GALAȚI

Doctoral School of Social and Human Sciences



SUMMARY OF THE DOCTORAL THESIS

**The implementation of theoretical
notions in the discipline of Physical
Education through the use of the
digital technology**

Ph.D. candidate,

Olaru Bogdan Sorin

Ph.D. mentor,

Prof. univ. dr. habil. Talaghir Laurențiu-Gabriel

Series SSEF: Science of Sport and Physical Education No. 5

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Summary

Introduction	5
PART I.....	6
THE CURRENT STATE OF RESEARCH.....	6
Theoretical knowledge from the discipline of Physical Education in the International space	6
Theoretical knowledge in the discipline of Physical Education and Sport in Romania.....	7
Conclusions regarding the current state of research.....	10
PART II.....	11
STUDIES REGARDING THE SITUATION IN ROMANIA OF THEORETICAL KNOWLEDGE IN THE DISCIPLINE OF PHYSICAL EDUCATION AND SPORTS	11
Development, validation and standardization of an instrument for measuring the level of theoretical knowledge of 5th and 6th grade students.....	11
Measuring the level of specialized theoretical knowledge of 5th and 6th grade students in the discipline of Physical Education and Sport.....	14
The perception of specialized teachers regarding theoretical knowledge in the discipline of Physical Education and Sport.....	17
PART III – EXPERIMENTAL RESEARCH ON THE IMPLEMENTATION OF THEORETICAL NOTIONS IN THE DISCIPLINE OF PHYSICAL EDUCATION AND SPORT THROUGH THE USE OF INFORMATION TECHNOLOGY.....	20
General conclusions, novelty elements and future research directions.....	24
References	26

Introduction

Sedentaryism is a risk factor that is increasingly highlighted by medical researchers as the cause of a wide range of chronic diseases. Studies that if we managed to show physical activity level in a percentage of 25% worldwide, the effect would have saved 1.3 million lives annually (Guthold et al., 2021; Lee et al., 2012). In this context, the discipline of Physical Education is seen as a prophylactic treatment (Warburton & Bredin, 2017), due to the fact that it is the main tool through which it is possible to act on a large number of the young population in order to increase the percentage of physically active people.

Given this situation, it was born concerned with the researchers in the field of Sports Science and Physical Education to answer the following question: "What is the most effective approach to the discipline of Physical Education to reach its maximum potential?" (Ennis, 2015; Young, 2008).

The specialized literature highlights several countries with high-performing educational systems, which place as the ideal of the Physical Education discipline, a concept called "Physical Literacy" (Whitehead, 2020; 2015; 2010). The path to this ideal requires the simultaneous development of four areas: (1) motivation, (2) confidence, (3) physical skills and (4) theoretical knowledge. Out of these four areas, our PhD thesis focuses on the area of specialized theoretical knowledge.

Studies of the notions that through the implementation of these theories, even if in the short term the time in which students are physically active is reduced, in the long term, many more students choose to engage in activities in order to maintain physical health (Cale & Harris, 2018). ; Demetriou & Höner, 2012; By Bourdeaudhuij et al., 2011).

In Romania, specialized theoretical knowledge, although it exists in the literature, is of very little interest both for Romanian teachers and researchers. Another important aspect is related to the fact that there is no study in which this variable of theoretical knowledge is taken into account, which means that never, in Romania, has the level of theoretical knowledge of students in the discipline of Physical Education been measured . and Sports.

Considering this lack of content regarding the implementation of their specialized theoretical notions in the discipline of Physical Education and Sport in Romania, this paper proposes the following objectives:

Objective 1 – To measure the level of theoretical knowledge of 5th and 6th grade students in Romania, in the discipline of Physical Education and Sport.

Objective 2 – To highlight the opinion of Physical Education teachers from Romania related to this component of the education process. Namely, specialized theoretical knowledge.

Objective 3 – Development of an annual planning that gives more attention to the field of specialized theoretical knowledge.

Objective 4 – To conduct an experimental research in which the effects produced by an educational intervention that focuses on the implementation of specialized theoretical notions in the discipline of Physical Education and Sport using information technology will be highlighted.

PART I

THE CURRENT STATE OF RESEARCH

In order to study the current state of research on the topic of the doctoral thesis, we made a parallel between the way in which the specialized theoretical knowledge in the discipline of Physical Education is approached in the international space, and the approach to the same subject in Romania.

Theoretical knowledge from the discipline of Physical Education in the International space

The discipline of Physical Education, as part of general education, has been recognized by the IOM (Institute of Medicine, 2013) as "the discipline that provides the only opportunity for all children to learn about physical movement and engage in physical activity" (p. 199). The same source states that, "the 60 minutes a day of physical activity is almost impossible to achieve in a physical education class, even with the highest quality curriculum. Quality physical education must include time for teaching activities and lessons that may not be physically active." (p. IX-X) The solution offered by IOM refers to the content taught in the Physical Education lesson: "Instead of focusing on the practical part, with the aim of recording the time of physical activity (n.r. the 60 min/day), a new curriculum approach emphasizes the need for students to accumulate knowledge that answers the question: why do we need to be physically active in life?" (p. 202).

For educating young people about the benefits and principles of an active and healthy life, the discipline of Physical Education proves to be the most viable way of intervention (Corbin, 2002). But Cloes (2017) emphasizes the fact that students do not know how to answer the question: "How do they benefit from the Physical Education discipline?". He invites specialized teachers to ask students for the answer to this question. And, he goes on to say, "Sometimes it's surprising to read the answers ... to see that most of these young people are unable to explain what the objectives of the discipline were." (p. 246). From this perspective, it is considered that a quality curriculum for the Physical Education discipline must not only engage students in practical activities, but must also offer students ample opportunities to accumulate and understand the theoretical notions necessary for developing and maintaining a lifestyle healthy throughout life (Cale & Harris, 2018; President's Council on Physical Fitness and Sport, 2009; Castelli & Valley, 2007).

Today's Physical Education focuses on educating the future adult to be able to self-manage physical activity throughout life. The authors speak of a new educational goal where, in the first place, is knowledge and understanding, unlike the previous approach in which athletic skills and simple participation in the Physical Education lesson were in the foreground (Matveev et al., 2020; Van Vuuren & Lambrianou, 2006).

In the international space we find several approaches to the Physical Education lesson that emphasize the educational character of this discipline. The distinctive feature of these approaches is that, in the teaching-learning process, they achieve a mix between theoretical knowledge and their practical applications. The three most common names/concepts are: Conceptual Physical Education (CPE) (Corbin, 2021; Shangguan et al., 2017; Liu et al., 2017); Fitness Education (Society of Health and Physical Educators, 2021; National Association for

Sport and Physical Education, 2021) and Physical Literacy (PL) (International Physical Literacy Association, 2022; Whitehead, 2010).

Other names of this approach are: health-related fitness knowledge (Keating et al., 2009); knowledge of physical fitness (Barnett & Merriman, 1994), exercise knowledge (Fitzgerald et al., 1994), perceptions of exercise (Desmond et al., 1990), knowledge of health and fitness concepts (Stewart & Mitchell, 2003) or knowledge (Schindler et al., 1996).

After presenting the main names and concepts from the international space that use specialized theoretical knowledge, we further analyzed the concrete ways in which this theoretical component is introduced in the Physical Education lesson (Iconomescu et al., 2021).

We therefore see that theoretical notions are taught and evaluated in the physical education lesson from primary education (Knisel et al. 2020; Ennis, 2015; etc.) and continuing with the secondary school Strobl et al., 2020; Frenn et al., 2005; et al.), high school (Dale & Corbin, 2000; Kulinna et al., 2018; et al.) and university (Maldari et al., 2023; Kulinna et al., 2009; et al.). Also, we identified universities that offer courses to future specialist teachers to prepare them with the methodology necessary to teach specialist theoretical knowledge (Corbin et al., 2020; Harris et al., 2020).

Another interest I showed in this first part of the PhD thesis focused on the identification of assessment tools used in measuring the level of theoretical knowledge in educational interventions which aims to promote physical activity - including the Physical Education lesson. We therefore identified the "questionnaire" as the most used measurement tool (Barnett et al., 2022; Chen et al., 2020; Society of Health and Physical Education, 2010; etc.), followed by the "interview" (Placek et al., 2001; Glaser & Strauss, 1999), but also a series of methods that we called "interactive methods", among which we mention: the creation of a specialized journal or the portfolio (Morrow et al., 2011).

Theoretical knowledge in the discipline of Physical Education and Sport in Romania

Before addressing the particular issue of specialized theoretical knowledge, we consider it important to pay attention to the name of this discipline. It is noticeable that in Romania the discipline is called "Physical Education and Sport", unlike the other countries in Europe, but also in the United States, Canada or Australia, where the name is "Physical Education". This fact forces us to analyze the definitions that authors offer to the two terms: (1) physical education; and (2) sports. But also on how the two concepts can be approached in the same school discipline.

Dragnea et al. (2006) defines "Physical Education" as: "a component of general education, expressed through a type of motor activity (along with sports training, competition, leisure activities, body expression activities and recovery activities), carried out organized or independent, whose specifically designed content aims to optimize the biomotor potential of the individual, as well as the cognitive, affective and social relational components, determining the increase the quality of life." (p. 10).

Sport is considered to be "the specific competitive activity in which the forms of practicing physical exercises are intensively utilized in order to obtain by the individual or collective the perfection of the morphofunctional and psychic possibilities, embodied in a record, an overcoming of one's own or that of the partner." (Alexe, 1974, p. 110).

Hoștiuc (2003) consider that "Physical Education and Sport are two activities that combine and between which have been established over time, multiple mutual links, but also increasingly important differences and distances" (p. 84) The author continues by drawing attention to a phenomenon that manifests itself more and more: "However, lately there is a manifest tendency, especially by non-specialists, to identify them, which is particularly harmful to school physical education. In differentiating the two activities, the predominant role is given by the objectives pursued, by their organization and development, and less by the exercise structures used, which up to a level can be similar if not identical" (p. 85).

On the other hand, the Physical Education and Sports Law no. 69/2000, treats the two phenomena together. We thus conclude that the specialized literature provides a clear conceptual delimitation between the two terms, but nevertheless, the legal framework treats them together, and the name of the discipline in the curriculum reinforces the confusion among students and non-specialists.

Next we shifted our focus to curricula. These went through a reform process aimed at building a long-term plan that would lead the student on a rational path throughout all the educational cycles of the Romanian education system (Ministry of National Education, 20141; 20142; 20172). Considering this aspect, the secondary school curricula must offer the student continuity in the process of "acquisition" of skills. The only curriculum that has not undergone changes for 14 years is that at the high school level (Ministry of Education, Research and Innovation, 2009).

The analysis of the curriculum highlights the fact that the main means used in physical education in Romania is the competition specific to sports branches. But even in this sport-based approach, the theoretical component is not excluded. The student needs a bag of theoretical knowledge related to the rules of sports games, the ways in which the specific efforts of each sports branch act on the body, the biomechanics of the execution of each procedure, etc. Thus, table 1 presents a selection of examples of contents of the secondary school curriculum, which require an approach from a theoretical point of view as well.

Table 1 - Theoretical contents of the Physical Education and Sports curriculum of the secondary school

clasa a V-a	clasa a VI-a	clasa a VII-a	clasa a VIII-a
<ul style="list-style-type: none"> • tools and techniques for determining morphological and functional indicators; • individual and collective hygiene rules; • signs of deterioration of individual and collective hygiene; • measures to maintain individual and collective hygiene; • exercises and rules for preparing the body for effort; 	<ul style="list-style-type: none"> • knowledge about: <ul style="list-style-type: none"> - frequent deviations from the correct body posture; - the causes that produce them and the means of preventing their installation; • knowledge about: <ul style="list-style-type: none"> - the importance of preparing the body for effort - the importance of breathing, with a restorative character; - rebalancing techniques; - ways to mitigate shocks; - measures to maintain individual and collective hygiene; 	<ul style="list-style-type: none"> • knowledge about: <ul style="list-style-type: none"> - food factors and types of effort that contribute to the increase in muscle mass; - food, clothing factors and types of effort that contribute to the reduction of adipose tissue; - the correct ratio between height and weight, specific for age and gender; 	<ul style="list-style-type: none"> • knowledge about: <ul style="list-style-type: none"> - anatomy and physiology of effort; - the harmful effects of intensive slimming treatments; • knowledge about: <ul style="list-style-type: none"> - balanced lifestyle (daily and weekly); - procedures for determining heart and respiratory rates, - recovery time after exercise, - the perimeters of the chest and its elasticity, determining factors of the pulmonary ventilation capacity;

Along with the reforms carried out in the primary and secondary schools regarding the curriculum in the discipline of Physical Education and Sport, the Ministry of National Education approved the publication of the text-book for this discipline. First, in 2017, three textbooks appeared for the 5th grade that follow the curriculum (Dragomir & Iordache, 2017; Oprea et al., 2017; Stănescu et al., 2017) and two textbooks entitled "Sport Training", one focused on the football branch (Teodorescu et al., 2017a) and the other on track and field (Teodorescu et al., 2017b). A sixth textbook was printed in 2018, this time for the 6th grade (Oprea et al., 2018).

Having a totally theoretical character, the text-book comes to provide the necessary knowledge to the students so that they are able to be aware of the practical activity specific to these sports branches. Also, with the help of this knowledge, the student will be able to make abstractions and will be able to clearly delimit the place of these phenomena in the social, emotional or moral environment.

Finally, what must be well emphasized to eliminate a large part of the confusion, is a clarification by Neagu (2018) who states that the role of the manual is not to replace movement and physical effort, but to explain, motivate and argue the importance of physical activity for health.

Regarding the evaluation of this component of the educational process, represented by the theoretical knowledge, it can be observed that the specialized literature from Romania not only recognizes the specialized theoretical knowledge - as an evaluation criterion in

Physical Education and Sport, but also offers concrete tools, such as: oral or written assessment, portfolio and project (Rață, 2004a).

Conclusions regarding the current state of research

When we compare the international and the Romanian approach, the first aspect that stands out is the name. In Romania, it seems that the discipline is made up of both "Physical Education" and "Sport" - two concepts clearly differentiated by the specialized literature. It is also noted that in Romania, the specialized curriculum states that "competition is the main form of organization" (Ministerul Educației Nationale, 2017b, p. 29), and for this reason, most of the contents are specific to different sports branches. On the other hand, the general objectives of the curriculum do not suggest anything about competition or sports disciplines. We can even say that these general objectives reflect very well the international approach based on public health.

Along with the changes in the program that have an echo in the international approach, the introduction of the specialized textbook is a clear proof of the theoretical component in this discipline. But Romanian teachers seem to be faithful to the traditional approach by rejecting this textbook (Talaghir et al., 2021a).

In a study conducted by Johannes et al. (2023) the level of implementation of the Physical Literacy concept in European countries was studied. Romania was also included in the study, and from figure 1 it can be seen that among the countries studied, Romania has the weakest level of implementation. It is equally true that there are countries where no evidence of implementation of the concept has been identified.

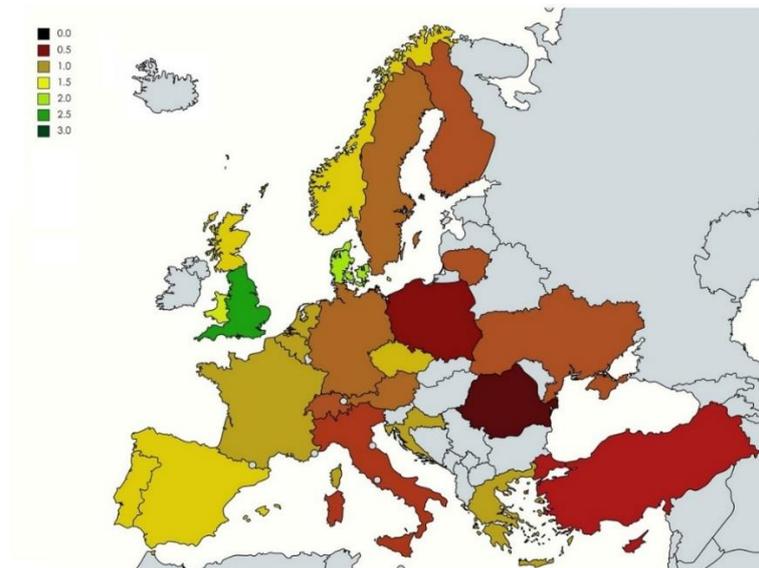


Figure 1 - A map of Europe visualizing the state of implementation in the participating countries (Johannes et al., 2023, p. 174)

PART II

STUDIES REGARDING THE SITUATION IN ROMANIA OF THEORETICAL KNOWLEDGE IN THE DISCIPLINE OF PHYSICAL EDUCATION AND SPORTS

The second part of this paper focuses on the conducting of three researches whose objective is to highlight the current situation in Romania regarding the specialized theoretical knowledge in the discipline of Physical Education and Sport. To do this, we focused on the two main actors of the instructional-educational process, namely students and teachers.

Regarding students, we wanted to measure the level of theoretical knowledge in the discipline of Physical Education and Sport. But, we faced the problem of not having a valid and standardized tool to make such a measurement. So, the first research of this part aimed at the development, validation and standardization of an instrument with which to measure the level of students' theoretical knowledge.

After the development of the tool, the second research aimed to use it in order to estimate the level of theoretical knowledge of the school population in the discipline of Physical Education and Sport.

The third research of the second part, focused on teachers. This aimed to highlight the perception of Physical Education and Sport teachers in Romania regarding the specialized theoretical knowledge of the discipline they teach.

In the following, we will briefly present the three researches.

Development, validation and standardization of an instrument for measuring the level of theoretical knowledge of 5th and 6th grade students

The purpose of the research

The present research aims to develop a standardized, consistent and constant instrument in the sense of validity and reliability - with which the specialist teacher can measure the level of theoretical knowledge of 5th and 6th grade students. The reason why we stopped at these two educational levels resides in the fact that only here, we find a specialized textbook.

A second goal of this research, which is directly related to the first, and refers to the tracking and recording of the development process of the tool, so that in the future, we can extend this process to other educational levels, whose thematic area differs.

Research methodology

The research methodology was built following the indications of the specialized literature that focuses on studying the development process of a theoretical knowledge assessment tool (Kishore et al., 2021; Trakman et al., 2017; Frary, 2003; Parmenter & Wardle,

2000). This methodology was built in the form of a sequence of eight steps that will be presented in the following.

Due to the fact that the results of one stage influence the approach of future stages, we will present both the methodology and the results cumulatively.

- Stage 0 - The plan to build and develop the evaluation tool

During this stage, a committee of 3 specialists in the field of Sports Science and Physical Education was formed, who were responsible for leading the entire research effort. Also at this stage, using scientific reasons, the form of the instrument (questionnaire) and its general characteristics were decided: the number of 25 items and 6 closed answer options for each.

- Stage 1 – Identification of thematic areas and distribution of the 25 items

Stage 1 focused on the delimitation of the thematic areas of the questionnaire (factors) and the rationale according to which the 25 items will be distributed – that is, the decision regarding the number of items that will operationalize each factor.

The segmentation of the content of theoretical knowledge was established in accordance with the structure of the Physical Education and Sports curricula, developed by the Ministry of National Education (Ministry of National Education, 2017) as follows: (1) Organization of motor activities; (2) Harmonious physical development; (3) Motor capacity; (4) Sports disciplines; (5) Personal hygiene and protection; (6) Behaviors and Attitudes.

Also at this stage, after the thematic areas were established, the 25 items for each area were distributed. The rationale behind this approach was, on the one hand, the percentage allocated to textbooks for each thematic area - calculated by the number of pages, and on the other, the expert opinion of the panel regarding the degree of relevance of the knowledge included in each thematic area.

- Stage 2 – Generation of the items pool

The objective of this stage was to generate as many quality items as possible, so that, in future stages, the best performing ones would be tested and then selected. Thus, each member of the panel of specialists had to develop ten times more items than needed for each thematic area.

The cumulative result of this phase was 831 items in the 5th grade and 812 in the 6th grade. Next, three panel meetings were organized, in which a number of 81 items (5th grade) and 67 (6th grade) were deleted - on the grounds that they were similar, and another 44/52 items had undergone changes such as: the wording was changed or minor changes were made within the answer variants. Following this second stage, a number of 750 items in the 5th grade and 745 in the 6th grade resulted in the next stage.

- Stage 3 – Selection of items from the perspective of specialists

In the 3rd stage, each panel member received the items from the previous stage and had to rate them on 4 dimensions: (1) the degree of clarity of the question; (2) the degree of clarity of the correct answer options; (3) the degree of difficulty of the item reported at the level of a 5th or 6th grade student – taking into account both the question and the answer options offered; and (4) the degree of relevance of the notion evaluated within the item (how important it is, in the expert's opinion, for a student to know the answer to that item).

The selection of the 25 best performing items began with the determination of the Cronbach's alpha coefficient, through which we identify the consistency of the answers given by the evaluators on the four dimensions: (1) the degree of clarity of the question; (2) the

degree of clarity of the correct answer options; (3) the degree of difficulty of the item; and (4) the degree of relevance of the evaluated notion.

The results highlight the fact that there are significant and strong correlations in the way the three evaluators rated the items in relation to the 4 dimensions. In other words, the redundancy of the repetition of some answers from the evaluators is noted: there is a strong, consistent, and statistically significant tendency for the evaluators to give similar answers in the evaluation of the items on the 4 dimensions.

The measures of consistency in the responses provided by each rater, for both 5th and 6th grade, allow us to consider the performance of each item, on each dimension, as a sum of the scores provided by each of the three raters.

Following this stage, the 1.0 versions of the instruments for measuring the level of theoretical knowledge of 5th and 6th grade students resulted.

- Stage 4 – Pre-testing

Pretesting version 1.0. of tests is aimed at identifying problems or unforeseen situations due to which the tool requires improvements or changes.

In this stage, the aim was to test the 25 items selected in the previous stage on a representative sample of subjects. In this pretest stage, the selection of a large sample is not of interest, but only a representative one (the subjects should be students of the ages and from the environments for which the test is standardized) because the characteristics of the sample of subjects are not measured by the test, but characteristics of the test relative to the sample of subjects.

Also during this stage, 12 students were selected as follows: the best 6 scores and the lowest 6 scores. These students will be invited to participate in the next stage - that of the interview.

- Stage 5 – The interview

In this stage, the 12 students selected in the previous stage were invited to participate in a structured interview which had the role of identifying the ambiguities regarding the lack of understanding of the meanings of the words in the questions and in the correct answer options

Thus, using the structured interview method, each student out of the 24 (12 on each educational level) was interviewed regarding the terms (concepts) they do not understand from each item out of the 25 from the previous stage.

The results indicated that the students encountered difficulties with the terms they should have known as a result of studying the theoretical content intended for the 5th and 6th grade in the Physical Education and Sport discipline. So, at the level of the specialist committee, it was decided not to make any changes in the structure of the test - given the fact that the test aims to evaluate the level of theoretical knowledge, that is, including the understanding or not of these terms. The given situation, in which the students do not know the meaning of these terms, is explained only by the lack of specialized theoretical knowledge of the students.

- Step 6 - Reliability testing

Using the test-retest method at an interval of 14 days, the ability of the test to provide predictable, repeatable results was demonstrated at this stage.

The results of the paired Student T test run on the data set collected in the 5th grade indicate a slightly higher value in the test scores ($\bar{X} = 10,53$ points; $S = 3,66$ points) compared to those from the retest ($\bar{X} = 10,3$ points; $S = 3,48$ points). However, the T-test

results confirm the null hypothesis indicating a value of $t(29) = 0.73$, $p = .472$, with a 95% confidence interval for the difference between means $[-0.42, 0.89]$ and an effect $d=0.13$.

At the 6th grade level, the average test scores were ($\bar{X} = 7,3$ points; $S = 2,55$ points) and on the retest $\bar{X} = 7,37$ points; $S = 2,72$ points. The paired Student T-test recorded a value of $t(29) = -0.17$, $p = .869$, 95% confidence interval $[-0.44, 0.38]$ and an effect of difference $d=0.03$. Which means that, just like at the 5th grade level, the difference in test and retest scores is not statistically significant.

Based on this, the test instrument has been shown to produce repeatable results as long as it is used on a sample of subjects representative of the study population.

Stage 7 – Test application guide

In this last step, a test application guide was developed in order to standardize the conditions under which the subjects are evaluated. Under this aspect, the guide provides a standard training of the personnel who will apply the test, so that similar testing conditions are created.

The conclusions of the research

We will state that the developed tools - in the form of a questionnaire - have in their composition items and answer variants with a high degree of performance from the perspective of clarity, relevance and difficulty. Also, the number of items (no. 25) that make up the questionnaire is the most suitable for the age group to which it is addressed.

Considering the rigorous methodology of construction, validation and standardization presented previously, based on the indications of the specialized literature, we will state that in this work a standardized, consistent and constant instrument was developed in the sense of validity and reliability, with the help of which the Education teacher Physics and Sport from Romania can test the level of theoretical knowledge of 5th and 6th grade students.

Measuring the level of specialized theoretical knowledge of 5th and 6th grade students in the discipline of Physical Education and Sport

The research question

What is the level of specialized theoretical knowledge of 5th and 6th grade students in Romania, in the discipline of Physical Education and Sport?

The reason why we restrict the studied population to these two educational levels refers to the fact that only in these two classes we find a specialized textbook that offers a standard content.

Research objectives

(1) Identification of a representative sample;

By fulfilling this objective, we take the first step with the help of which the results that we will collect, process, represent and interpret, will be able to be attributed by approximation to the studied population - namely the 5th and 6th grade students in Romania.

This objective translates into 3 other secondary objectives:

- Identifying those characteristics of the population that are relevant to the current research;
- Identifying a consistent sampling methodology;

- Applying the sampling methodology;
- (2) Measurement of the sample of subjects;

After the previous objective was achieved, at this point we set out to identify a way of measuring the sample that would be as economical as possible from the perspective of the consumption of financial, human and logistical resources.

At this point, the question of the measuring instrument cannot be raised because this matter has been resolved by the research conducted previously.

- (3) Collection, processing and interpretation of data;

This last objective is an obvious one, and it refers to the whole process by which we come to approximate the characteristics of the sample as those of the population being studied.

Sampling

In this research, the technique of probability sampling (Probability Sampling) was used in two stages as follows:

1. In the first phase, using the "cluster sampling" technique (Taherdoost, 2016; Wilson, 2010), we were interested in randomly sampling 20% of Romania's counties. So, using the random selection tool "Analysis ToolPak in Excel" (Microsoft, 2021), the 7 counties from which the subjects will be chosen were identified;

2. In the second stage, the technique of "Stratified random sampling" (Taherdoost, 2016) was used, in which we were interested in obtaining proportions similar to those of the studied population of students who work in the rural environment and the urban according to the data on the school population in the year 2020-2021 according to the National Institute of Statistics.

Description of the research

In order to measure the representative sample, we used the web pages of the county school institute, where the lists with the email addresses of all the school units in the territory can be found. So we proceeded to send invitations to participate in the study to all the units in the 7 counties selected in the first stage. In the invitations addressed to the directors, they were informed about the objectives of the research and about the necessary actions for participation. Specifically, principals were required to contact the 6th and 7th grade principals to participate in a videoconference training session on test administration. At this stage, it should also be mentioned that, where the directors of the units requested, partnership contracts were signed between the "Lower Dunărea de Jos" University in Galati and the school unit in question. A number of 11 such contracts were signed.

During the video conference, the class leaders received information about the study and how to apply the test. Also, they received the "Google Forms" links with the actual test that they had to apply to the students.

After the data were collected according to the methodology described above, in order to complete the strata requested in the 2nd stage of the sampling process, the directors of educational units who did not express their desire to participate in the first stage, to make the invitation again, this time in a direct form.

After the layers were made, in each of the 7 counties, the data were analyzed statistically, the results were discussed and the conclusions were formulated.

Results and discussion

At the 5th grade level, the sample consisted of a number of 2076 evaluated subjects, with a representativeness similar to that of the population both from a regional, environmental and gender perspective. And in the 6th grade, 2352 subjects with the same result in terms of stratification.

We begin the descriptive analysis of the data by presenting the main values of the scores recorded in the data sets collected when evaluating the content of the 5th grade (Table 2), respectively the 6th grade (Table 3).

<i>Table 2 – Values of scores at the evaluation - 5th grade</i>		<i>Table 3 – Values of scores at the evaluation - 6th grade</i>	
	Result		Result
Average	8.94	Average	12.18
Standard deviation	4.14	Standard deviation	4.59
Interquartile range	6	Interquartile range	7
Skew	0.3	Skew	-0.21

In interpreting the results of the instrument for measuring the level of theoretical knowledge, the maximum number of correct answers is 25, and each correct answer is worth 4 points on the grading scale - so 25 correct answers multiplied by 4 points = 100 points, which is the equivalent of a grade of 10 .

After recalling this information, we notice that in the 5th grade the average is 8.94 correct answers, which multiplied by 4 points, means an average grade of 35.8 - approximately, it would be a grade of 4. And in the 6th grade 12.18 correct answers - multiplied by 4 points means 48.72, i.e. grade 5.

The results in the 5th grade indicate that the difference between the averages of the correct answers of the group of male subjects ($\bar{M} = 8.51$, $S = 3.89$) and those of female subjects ($\bar{M} = 9.42$, $S = 4.35$) is statistically significant $t(1967.18) = -4.99$, $p < .001$, 95% confidence interval $[-1.27, -0.55]$. So the null hypothesis is rejected.

However, the effect size indicates a value of $d=0.22$, which is within the parameters that delimit the smallest effect. We thus conclude that the difference between the means of the female and male gender groups presents an effect much too small to be taken into account.

In the 6th grade, the same thing is observed, namely that the mean of girls ($\bar{M} = 12.5$, $S = 4.48$) is higher than that of boys ($\bar{M} = 11.87$, $S = 4.67$). The Student's T-test for two independent samples gives a value of $t(2350) = 3.32$, $p = .001$, 95% confidence interval $[0.26, 1]$, which means that the null hypothesis is rejected. But here too we have a very small effect $d=0.14$.

Regarding the "medium" variable, the results of the Student T test at 5th grade shows the fact that the difference between the average of the correct answers of the group of subjects from the urban environment ($\bar{M} = 9.16$, $S = 4.23$) and those from the rural environment ($\bar{M} = 8.48$, $S = 3.91$) is statistically significant $t(1465.45) = 3.6$, $p = <.001$, 95% confidence interval $[0.31, 1.04]$. So the null hypothesis is rejected. But, as in the case of the division of subjects

by gender, the effect is extremely low ($d=0.17$). The difference between the averages of the groups in the urban environment and those in the rural environment, presents an effect much too small to be able to represent a defining element.

In the 6th grade, subjects from the urban environment registered a higher value ($\bar{M} = 12.05$, $S = 4.91$) than those from the rural environment ($\bar{M} = 12.22$, $SD = 4.46$). The paired Student T-test recorded a value of $t(1017.72) = -0.75$, $p = .454$, 95% confidence interval $[-0.61, 0.27]$. So the null hypothesis is rejected. But, as in the case of the division of subjects by gender, the effect is extremely low ($d=0.03$).

Comparison of the average results per county indicated that there are a number of pairs of counties whose average results are significantly different. But, if we calculate the average grade obtained by each county (after the operation: number of correct answers multiplied by 4 points), we notice that in the 5th grade the average grade obtained by students from the 7 counties varies between grade 3 and grade 4, and in the 6th grade it is between grade 4 and grade 5.

Conclusions

The level of theoretical knowledge of 5th and 6th grade students in Romania, in the discipline of Physical Education and Sport, is extremely low. In the 6th grade, the grade average is at the limit of the passing mark (grade five) and in the 5th grade, the grade average is below this limit.

Female subjects seem to have a higher level of theoretical knowledge in this subject than boys. And from the perspective of the environment, there are no considerable differences between the urban population and the rural population.

Also, the average grade per county varies very little, which means that the situation of teaching and implementing theoretical knowledge at the national level is the same from one county to another.

The perception of specialized teachers regarding theoretical knowledge in the discipline of Physical Education and Sport

Research objectives

The main purpose of this research is to determine the perception of the teachers of Female Education and Sport vis-à-vis the approach to the discipline that I presented in the first part of the paper, and which has as its distinctive feature the creation of a mix between a theoretical component and a practice.

Since the objective formulated above is quite general, in order to achieve it, we considered it necessary to formulate five other secondary objectives:

1. Highlighting the perception of Physical Education and Sports teachers towards the two components: the theoretical and the practical;
2. Highlighting the differences in the perception of teachers with different demographic characteristics;
3. The need for a digital application to help the interactive implementation of theoretical notions;
4. Creating a questionnaire and testing the consistency of the items that compose it;
5. Application of the questionnaire on a representative sample of Physical Education and Sport teachers from Romania;

Building the quantitative assessment tool

Regarding the form of the quantitative assessment tool, we chose the questionnaire because the advantages best suited the type of research we planned. Among these advantages are: ease of completion, allows for the investigation of deep perceptions, is not a disruptive influence, provides thinking time for the subject to understand the item and provide the most accurate response, low cost, allows comparison of responses between groups different (Negara & Popov, 2017).

The Google Forms platform was used and following the indications of the specialists, the questionnaire developed for the needs of this constative research has three parts: (1) an introductory section; (2) a section requesting demographic data; and (3) a section requesting expert opinion.

Sampling

Since the sociodemographic characteristics of the studied population vary significantly from year to year, an estimate of the studied population was made to be below 50,000 potential respondents. Then, invitations to participate in the survey were distributed through professional communication networks (forums, social media) to the entire study population.

Within the mixed randomization process (systemic, stratified and aggregate based) we were interested in obtaining a representative batch from the perspective of the 5 levels of experience that we delineated within the demographic information. So, using all the communication resources identified by us, we sent invitations on all communication platforms.

Presentation and discussion of the results

A total of 210 Physical Education and Sports teachers responded to our request to complete the questionnaire. They had a balanced representativeness both from the perspective of gender and experience levels.

The results on the four factors of the questionnaire show that teachers value the practical component more than the theoretical one. But, even if the theoretical component seems to be less appreciated, the recorded value of 3.4 places the answer somewhere between the answer option "Enough" and "A lot". Which allows us to state that teachers do not reject the theoretical component.

The fourth perspective, is the one that focuses on the teachers' opinion regarding the need for an application to help them implement theoretical notions in the Physical Education and Sports lesson. The average score of 3.7 shows us a value close to the answer option "A lot", which highlights the fact that specialized teachers are open to using such an application in the classroom.

Another aspect that requires discussion, refers to the comparison of the average values recorded at the 4th factor (3.7) with those recorded at the perspective towards the theoretical component (3.4). It is observed here that teachers are more open to using a digital application to implement theoretical notions than to the theoretical component. We explain this situation by the fact that teachers are much more willing to teach a theoretical content in the situation where the effort is lower.

In the analysis of correlations between teachers' answers to the 10 items of the questionnaire, it is noted that, between the answers of teachers who appreciate the use of a textbook (I7) and those who appreciate the theoretical evaluation (I9) ($r = 0.617$; $p < .01$); the responses of teachers who appreciate the use of a textbook (I7) and those who appreciate

the need for theoretical content in the PE lesson (I6) ($r = 0.437$; $p < .01$); and the third intra-factorial correlation between the responses of teachers who appreciate the necessity of theoretical content (I6) and those who appreciate theoretical evaluation (I9) ($r = 0.542$; $p < .01$). These results allow us to state that the teachers' perception of the theoretical component (factor 3) is very clear, and those who consider it important in the Physical Education and Sport lesson, consider all 3 elements that make it up important: (1) content theoretical; (2) the use of the textbook and (3) the student's grade in this discipline should also count the theoretical assessment.

If we analyze the correlations between the items that make up the practical component (factor 2), we observe a much weaker correlation ($r = 0.162$ and $p < .05$) between the answers of teachers who appreciate the necessity of practical content (I5) and those who appreciate the evaluation of motor performance (I8). Which allows us to state that there is no consensus among teachers as strong as the one regarding the theoretical component. And this situation is supported by the opinion of specialized literature which says that the use of practical content is necessary in the education process in the discipline of Physical Education and Sport, but the evaluation of motor performance can be contrary to the educational intention of this discipline (Society of Health and Physical Educators, 2021 Macdonald (2011)).

Another type of correlations that require discussion are those between items that are part of different factors. Within this type of correlations, we are interested in the correlations between the items that make up factors 2, 3 and 4 – because the responses to the items that make up factor 1 are close to the maximum.

Conclusions

Teachers' opinions are divided regarding the necessity of the theoretical and the practical component within the discipline of Physical Education and Sport. Even if the practical component register a higher appreciation compared to the theoretical one, the participating teachers in our study do not neglect the role of theoretical knowledge to complement the practical activity.

Regarding the usefulness of a digital application that uses theoretical knowledge, there seems to be an openness to this idea – which highlights the need for such applications to be developed to support the teaching-learning process in Physical Education and Sport. Such applications could help a lot in the assimilation of theoretical knowledge, the affinity that the young generation has for the digital environment being known.

This study also highlights the need for universities that train future Physical Education and Sport teachers to adapt their training programs in such a way as to prepare their students to achieve a mix between a theoretical and a practical component when teaching children.

PART III – EXPERIMENTAL RESEARCH ON THE IMPLEMENTATION OF THEORETICAL NOTIONS IN THE DISCIPLINE OF PHYSICAL EDUCATION AND SPORT THROUGH THE USE OF INFORMATION TECHNOLOGY

In the third part, we will carry out an experimental research in which we will highlight the effects produced by an educational intervention that uses theoretical notions in the discipline of Physical Education and Sport.

More concretely, using the information presented in the first two parts, we will design an educational intervention that has as a distinctive feature the fact that it is pursued with more interest than in traditional teaching options - the implementation of specialized theoretical notions in the discipline of Physical Education and Sport.

Given the fact that the teaching of these theoretical notions risks reducing the attractiveness of the lessons, we proposed the use of a computer application in the form of a game that would bring an interactive element to the instructional-educational process.

Research hypothesis

By using a digital application in the form of a game in the lesson of Physical Education and Sport, the theoretical notions of the specialty will be implemented much more effectively than in the traditional approach.

Research stages

The stages of the experimental research are presented in figure 2.

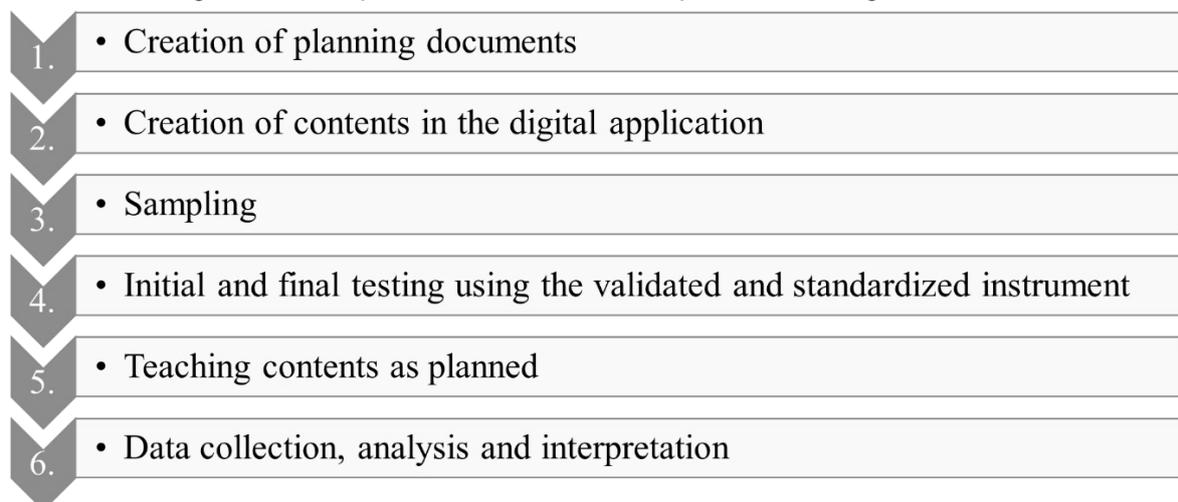


Figure 2 - The stages of the experimental research

1. Creation of planning documents

In the planning process, the learning units for the experimental classes aimed to allocate three theoretical lessons in each of the five modules of the year. In addition to these theoretical lessons, the learning unit entitled "specialized theoretical knowledge" had a permanent character throughout the year.

On the other hand, in the control classes, similar to the experimental classes, the learning units had the same structure with the difference that, instead of theoretical lessons, there were practical lessons that extended the thematic cycle with a practical character.

The theoretical lessons planned three times per module were held in the classroom and were divided into two parts: (1) in the first part the textbook was used to study the content planned for that lesson; (2) and in the second part, a digital application was used in the form of a game, with the aim of reinforcing the implementation of the notions taught in the first part of the lesson.

2. Creating the contents in the digital application

The digital application used in the experimental research is called "Kahoot!". It focuses exclusively on the instructional-educational process and has at its center the idea that the best way to assimilate knowledge and skills is by stimulating curiosity and using play (Wang, 2015). From this perspective, the stated objective of the platform is to develop the maximum learning potential of each student by stimulating curiosity in interactive games played in a social setting made up of colleagues and friends (Kahoot, 2023).

The tool represented by the application Kahoot! is one that has received increased attention from specialists. Thus, the positive effects that this tool has on several levels have been demonstrated, compared to traditional ways of teaching the content (Wang & Tahir, 2020).

There are several ways that the content of a Kahoot! can be played by students. This decision is made by the game host when they initiate it, but the same content can be played in all available forms. In our research we used all forms.

To be able to use the Kahoot! either way, it is necessary for the teacher to create contents first. These contents are represented by multiple choice questions. For our research we created content for each learning unit in the planning.

Once created, these contents can be distributed to students in any of the ways presented in the previous sub-chapter. This fact provides diversity and so the concepts can be repeated and reinforced until they are assimilated by the students.

The contents for the app have been built separately for each class as there are different textbooks.

3. Sampling

After establishing the inclusion/exclusion criteria of the subjects, for practical reasons it was decided that the groups of subjects should be made up of the collectives of a class. From this perspective, the following research question was born: What is the optimal number of subjects so that the results are relevant?

In order to be able to answer this question we performed three analyzes regarding the required sample sizes in order to perform the Shapiro-Wilk, Levene and Student t tests.

Total sample size: According to the analysis, the total sample size required to perform the Shapiro-Wilk test with the specified parameters is 22 subjects. This sample size is considered adequate to obtain results with statistical relevance in our analysis. The actual power result indicates a test power of 0.9508078, which meets the standard required level for scientific research.

According to the analysis, the total sample size required to perform the Levene test with the specified parameters is 18. The actual power indicates a value of 0.9655194, which

suggests a very good ability to detect significant differences (the probability of correctly rejecting the null hypothesis is raised). In conclusion, according to the results of the analysis performed, a total sample of 18 subjects is required to perform the Levene test with the specified power of 0.95 and significance level of 0.05.

In the case of the Student T-test, the results suggest that to detect significant differences in size between the control and experimental groups at the 95% confidence level and with a test power of 95%, a total sample of 50 subjects is required (25 in each group). With true power close to 95%, this sample should allow for the detection of significant differences, consistent with the research objectives.

After the inclusion/exclusion requirements and the optimal number of subjects that the representative sample must meet were determined, the phase of selecting the subjects to be included in the research was moved to.

In the experimental research, 4 classes from the Galati "Miron Costin" Secondary School were included, which were divided into control and experiment classes.

4. Initial and final testing

The initial and final testing was carried out in the IT laboratory of the educational unit, using the tool developed, validated and standardized within the second part of the doctoral thesis.

5. Teaching contents as planned

The contents were delivered as planned as follows:

- In the control class, theoretical knowledge was taught during practical classes;
- In the experiment class, in the 3 lessons of each module, the theoretical contents were taught using the Kahoot! digital application;

6. Data collection, analysis and interpretation

The central results of the four data sets collected and analyzed at the 5th grade level are presented in table 4, and at the 6th grade table 5. For each data set, the abbreviation consists of the number 5 or 6 that represents the educational level (5th or 6th grade), a letter ("M" or "E") representing the control grade (M) or the experimental grade (E), and a time point: initial (T0) or final (T1).

Table 4 - The central values of the 4 data sets in the 5th grade

	5M-T0	5M-T1	5E-T0	5E-T1
Average	6.81	6.95	6.58	11.12
Median	7	7	6.5	10.5
Standard deviation	1.99	2.56	2.73	3.29
Interquartil range	2	4	3	4
Skew	-0.34	-0.26	0.16	-0.42

Table 5 - The central values of the 4 data sets in the 6th grade

	6M-T0	6M-T1	6E-T0	6E-T1
Average	6.26	6.35	7.65	13
Median	6	7	8	13.5
Standard deviation	2.93	2.48	2.32	3.36
Interquartil range	4.5	2.5	3	3.25
Skew	0.09	-0.22	0.25	0.6

In comparing the results of the control class at the time of initial testing Vs the results of the experimental class at the time of the initial testing in 5th grade, eest T for independent samples (equal variances assumed) indicates that the difference between the sample means was not statistically significant, $t(45) = 0.33$, $p = .746$, 95% Confidence Interval [-1.2, 1.67], effect size $d=0.1$. Thus, the null hypothesis was retained. This suggests that there is no statistically significant difference between the means of the Control and Experiment class Total Scores at baseline T0, confirming the visual exploration conclusion that the two groups are similar at baseline.

In 6th grade, independent samples T-test (equal variances assumed) indicates that the difference between the sample means was not statistically significant, $t(41) = -1.71$, $p = .096$, 95% Confidence Interval [- 3.03, 0.26], $d=0.52$. Thus, the null hypothesis was retained.

This aspect is crucial for ensuring the internal validity of subsequent analyzes that aim to discern the impact of interventions on each group.

In the case of comparing the results of the control class at the time of the initial testing Vs the time of the final testing, in the 5th grade, the paired Student T test shows that the results of the scores recorded by the control class at the time of the initial testing ($\bar{x} = 6,81$, $S = 1,99$) are lower than at the final testing ($\bar{x} = 6,95$, $S = 2,56$). Paired sample Student's T-test showed that this difference was not statistically significant, $t(20) = -0.48$, $p = .634$, 95% Confidence Interval [-0.76, 0.47] and effect size $d = 0.11$.

In the 6th grade, the control class at the time of the initial testing ($\bar{x} = 6.95$, $S = 2.46$) are smaller than at the final testing ($\bar{x} = 7.65$, $S = 2.32$). Paired sample Student's T-test showed that this difference was not statistically significant, $t(19) = -0.9$, $p = .378$, 95% Confidence Interval [-2.32, 0.92], $d=0.07$.

In other words, this suggests that there is no statistically significant difference in the means of the control class between the initial and final testing. This confirms the hypothesis that the control group would remain relatively stable during the intervention period.

The results of the 5th grade experiment, at the time of the initial testing ($\bar{x} = 6.58$, $S = 2.73$) recorded values that are lower than the results from the final testing ($\bar{x} = 11.12$, $S = 3.29$). Paired-sample Student's T-test showed that this difference was statistically significant, $t(25) = -8.66$, $p = <.001$, 95% Confidence Interval [-5.62, -3.46].

In the 6th grade, the results of the experimental class at the time of the initial testing ($\bar{x} = 6,58$, $S = 2,73$) recorded values that are lower than the results of the final testing ($\bar{x} = 11,12$, $S = 3,29$). Paired-sample Student's T-test showed that this difference was statistically significant, $t(19) = -6.64$, $p = <.001$, 95% Confidence Interval [-7.04, -3.66]. Effect value $d=1.49$ – value indicating a strong effect.

Another important aspect is represented by the value of the effect $d=1.7$ – a value that indicates a strong effect.

The conclusions of the research

Both in the case of the 5th and 6th grades, it was demonstrated that at the time of the initial testing there was no statistically significant difference between the two groups, which validates the subsequent results, proving the interchangeability between the control group and experiment at the time before the implementation of the educational intervention.

Within the control class, the Student T test preceded and validated by the tests regarding the normality of the distribution of the data and the equality of the variability of the data (where applicable), shows that between the time of the initial testing and the time of the final testing, there are no statistically significant changes in terms of the level of theoretical knowledge of 5th and 6th grade students in the discipline of Physical Education and Sport. This fact allows us to conclude that, working in the traditional version, in which theoretical notions are transmitted during practical lessons, students do not assimilate the content.

When the experiment class was analyzed in the same way between the initial and final testing, the results indicated statistically significant differences, and the values of centralities of homogeneity revealed significant improvements in the students' scores at the final testing compared to the initial one. These results translate into the claim that using the digital application Kahoot! in the manner planned and implemented in the present experimental research, the level of theoretical knowledge in the discipline of Physical Education and Sport can be significantly increased.

Another important aspect regarding the conclusions is the one that focuses on the comparison of the results recorded by the experimental and control groups at the final testing. Statistically significant differences are also noted here, and in conjunction with the average results of both groups at the final test, we can state that the teaching methodology used in the experimental group is much more effective than the traditional variant, used in the case of the control group, with reference to the implementation specialized theoretical knowledge.

General conclusions, novelty elements and future research directions

General conclusions

From the first part of the thesis, we could see that in all countries with high-performing educational systems, the discipline of Physical Education is totally delimited from the field of sports by the fact that the main interest is not to reach a set of physical performance standards. They even go so far as to say that the reporting of physical performance results is contrary to the educational intention of this discipline.

Also, in the first part, it was emphasized that in the educational approach of the Physical Education discipline, theoretical knowledge plays an extremely important role. This field of knowledge is also found in Romania. But, as was shown in part II, the specialized theoretical knowledge is only by name listed among the components of the educational process.

The second part highlighted the extremely low level of theoretical knowledge of Romanian students in the discipline of Physical Education and Sport. Also, we have seen that specialized teachers, even if they appreciate the practical component of the lesson as more

important, recognize also the need to achieve a mix between theory and practice in the discipline they teach.

The third part of the thesis presented an innovative approach through which specialized theoretical knowledge can be successfully implemented in the Physical Education and Sports lesson. In addition to the outstanding results regarding the level of theoretical knowledge, this approach presents a high degree of attractiveness among students.

A secondary result of this approach refers to the fact that by using this type of planning, the problem of medical exemption in this discipline will be eliminated. Students who present such an exemption can be actively integrated into the educational process to which they are entitled by law.

The novelty elements of the doctoral thesis

The four novel elements of the doctoral thesis are the following:

1. Development, validation and standardization of the instrument for measuring the level of specialized theoretical knowledge;
2. The way of planning the educational intervention;
3. Using the computer application Kahoot! for the first time in the Physical Education and Sport lesson in Romania;
4. The contents developed within the digital application;

Future research directions

- Other tests to measure the level of theoretical knowledge;
- Consideration of specialized theoretical knowledge within other researches;
- Creating other contents in the digital application;
- Creation of a methodology for teaching specialized theoretical knowledge in the discipline of Physical Education and Sport;

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