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DIGITAL EDUCATION FOR PHYSICAL CULTURE AND SPORT:
VIEWS AND EXPERIENCE

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Abstract

Digital education is the logical stage of social life's digitalia. In the field of Russian physical education digital technologies have been actively developed and implemented over the past eight years. The purpose of this study is to determine a systematic view of the digitalization of education and the place of the author's position in it, formulated by the results of a three-year pedagogical experiment in the implementation of the distance course "The highest achievements' sport as a sphere of creative activity". We have revealed that the distance educational format, as well as the traditional educational format, allows, performing tasks of current control (writing a lecture notes with a further answer to control questions in the form of a specific table, writing creative homework with a further answer to control questions in the form of a specific table, answers to control questions on topics of discussions and heuristic conversations in the form of a specific table, writing theoretical and creative essays with further preparation of presentations for their distance defense by way of answers to control questions in the form of a specific table, performing author's research based on the analysis of abstracts of dissertations by leading scientists on the subject of the course), fully prepare for passing the intermediate control (exam) and get the final certification in academic discipline.

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1. Introduction

1.1. Definition of concepts

Digital education is considered as a type of education that allows the formation of knowledge, skills, possessions (experience) and competencies through the digital educational environment (Jiang et al., 2019; Kim et al., 2013).

One of the powerful technologies used by digital education is distance education technology (Dede, 1996).

Distance learning is the leading pedagogical link in distance educational technology, represents “distance learning” through a digital educational environment, includes all the teaching components (goal, tasks, means, methods, teaching methods, techniques, technologies, organizational forms) (Anderson & Dron, 2011; Bozkurt et al., 2015; Zawacki-Richter et al., 2009).

2. Literature review

2.1. Determining the relevance of the study

Currently, in the field of physical education, distance learning technologies are actively developed, implemented and applied (Bordovsky et al., 2019; Chechel'nitskaya, 2014; Landa, 2016; Lukina et al., 2019; Petrov, 2017; Somkin et al., 2019; Ul'yanov & Kovalenko, 2016; Veselovskaya et al., 2018; Zakrevskaya et al., 2018).

One of the educational platforms, where distance education technology is being actively developed, is the university website of distance education of The Federal State Budget Educational Institution of the Higher Education "National State University of Physical Culture, Sport and Health named after P. F. Lesgaft, Saint-Petersburg." One of the distance courses functioning within the framework of this educational platform is the distance course “The highest achievements' sport as a sphere of creative activity”, the analysis of which this scientific article is devoted to.

The highest achievements' sport as a sphere of creative activity: the content of the distance course.

The distance course “The highest achievements' sport as a sphere of creative activity” is developed in full compliance with The regulation on current and midterm student academic progress and mid-term certification adopted at The Federal State Budget Educational Institution of the Higher Education “National State University of Physical Culture, Sport and Health named after P. F. Lesgaft, Saint-Petersburg” and with a work program of the discipline, is intended for graduate students, both full-time and part-time, who have not mastered the academic discipline within the time schedule set for classroom studies or for graduate students enrolled in an individual teaching schedule. The mastering of the distance course “The highest achievements' sport as a sphere of creative activity” includes the following types of tasks within the current control: writing a lecture notes with a further answer to control questions in the form of a specific table, writing creative homework with a further answer to control questions in the form of a specific table, answers to control questions on topics of discussions and heuristic conversations in the form of a specific table, writing theoretical and creative essays with further preparation of presentations for their distance defense

by way of answers to control questions in the form of a specific table, performing author's research based on the analysis of abstracts of dissertations by leading scientists on the subject of the course (Mikhaylova, 2014, 2015). Further, the graduate student must pass an intermediate auditory audit (in the form of an exam) without fail.

3. Research methodology

Research methods (according to the classification of B. G. Ananyev in the modification of Yakhontov (2002) for sports and pedagogical research and the author's supplement): comparative method, case studies, a stating closed natural absolute pedagogical experiment, frequency analysis, analysis of contingency tables, correlation analysis, genetic method, theoretical modeling.

4. Empirical research results

Determining the effectiveness of mastering educational material and building competencies of graduate students within the framework of the distance course “The highest achievements' sport as a sphere of creative activity”.

4.1. Results from descriptive statistics (frequency analysis)

As shown in Figure 1, it is obvious that about 65% of all graduate students enrolled in the distance course “The highest achievements' sport as a sphere of creative activity” activated their personal accounts on the university website of distance education of The Federal State Budget Educational Institution of the Higher Education “National State University of Physical Culture, Sport and Health named after P. F. Lesgaft, Saint-Petersburg”. Here we consider all graduate students, studying both in full-time and part-time forms of study (position C), however, when analyzing positions A and B, we get an identical distribution of data from individual samples.

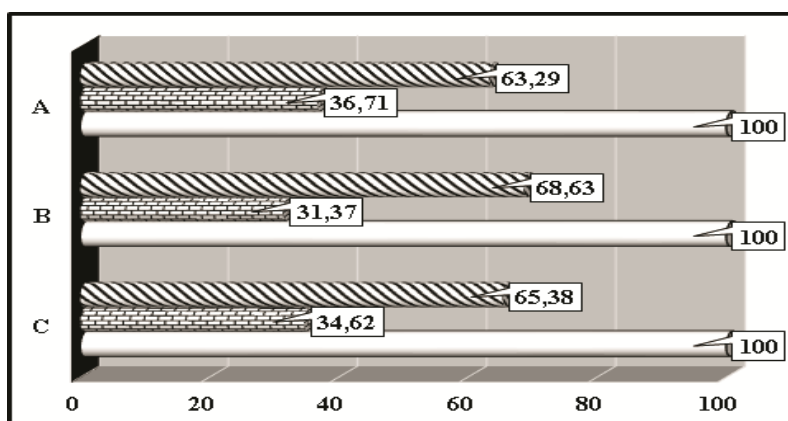


Figure 1. Distribution of graduate students, recorded on the distance course “The highest achievements' sport as a sphere of creative activity”, according to the criterion of activating their personal accounts on the university website of distance education (%) (filling “strips” – graduate students, who activated their personal accounts, filling “bricks” – graduate students, who did not activate their personal accounts, filling “white” – all graduate students, enrolled in the distance course “The highest achievements' sport as a sphere of creative activity”; A – graduate students studying in full-time studies (n = 79), B – graduate students studying in part-time studies (n = 51), C – graduate students studying in all forms of study (n = 130)

Figure 2 (position C) shows that only 48% of all graduate students, who activated their personal accounts on the university website of distance education to master the distance course “The highest achievements' sport as a sphere of creative activity”, began to master it (probably, the other graduate students in arrears in this subject were eventually expelled, since the distance course was considered as the only educational technology for the development of educational material and the delivery of tasks of current control after the end of the classroom about the specified discipline). However, when analyzing the distributions depending on the form of study, it becomes clear that more of the full-time graduate students (56%; position A) have started the distance course compared to graduate students of the correspondence course (37%; position B).

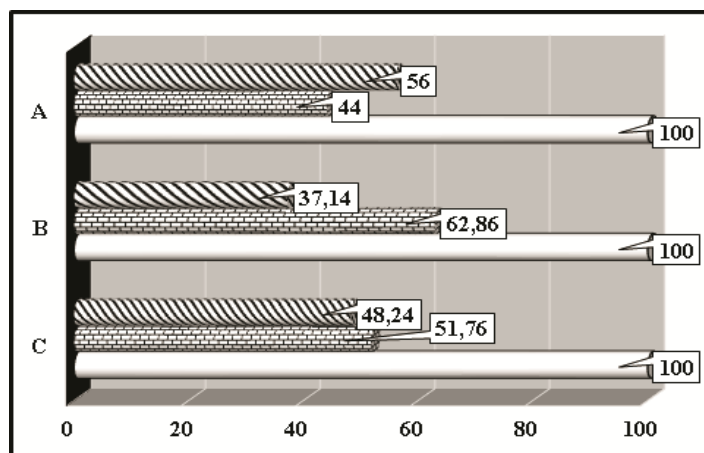


Figure 2. Distribution of graduate students, who have activated their personal accounts on the university website of distance education to master the distance course “The highest achievements' sport as a sphere of creative activity”, depending on whether they started to master the course or not (%) (filling “strips” – graduate students, who began to master the course, filling “bricks” – graduate students, who did not begin to master the course, filling “white” - all graduate students, who activated their personal accounts on the university website for distance learning to master the distance course “The highest achievements' sport as a sphere of creative activity”; A – graduate students studying in full-time studies (n = 50), B – graduate students studying in part-time studies (n = 35), C – graduate students studying in all forms of study (n = 85))

It was found that about 75% of all graduate students (Figure 03), who began to master the distance course “The highest achievements' sport as a sphere of creative activity”, were allowed to pass intermediate control (exams; that is, they fully mastered the academic course, completed the tasks of the current control and demonstrated the required competencies no lower than at the threshold level). This feature does not depend on the form of teaching (positions A, B, C).

It was revealed that about 74% of all graduate students (Figure 04; position C) admitted to passing the intermediate control (exam) in the academic discipline “The highest achievements' sport as a sphere of creative activity” received final certification on it. This trend is slightly more characteristic of full-time graduate students (76%; position A) and a slightly lesser extent for distance learning graduate students (70%; position B).

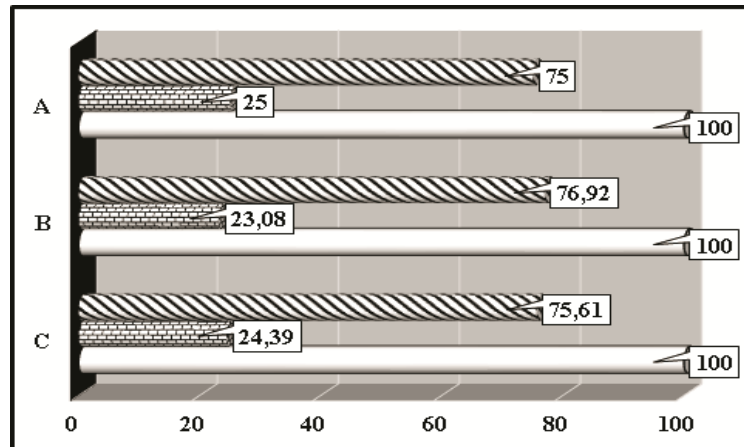


Figure 3. Distribution of graduate students, who began to master the distance course “The highest achievements' sport as a sphere of creative activity”, depending on whether they were allowed to pass the intermediate control (exam) or not (%) (filling “strips” – graduate students admitted to passing the intermediate control (exam), filling “bricks” – graduate students not admitted to passing the intermediate control (exam), filling “white” – all graduate students, who started to master the distance course “The highest achievements' sport as a sphere of creative activity”; A – graduate students studying in full-time study (n = 28), B – graduate students studying in part-time education (n = 13), C – graduate students studying in all forms of education (n = 41))

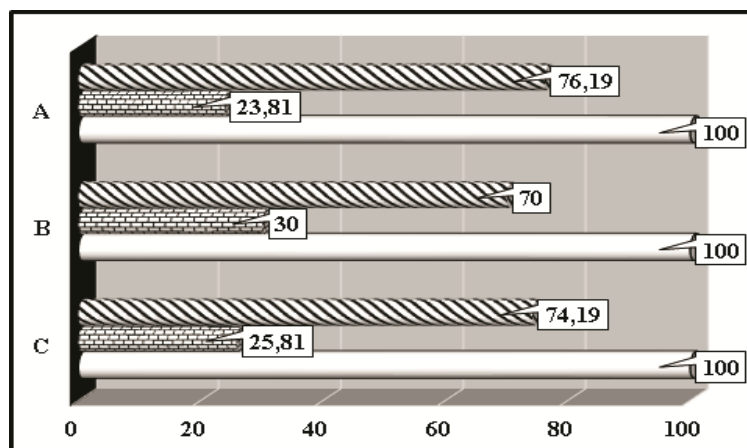


Figure 4. Distribution of graduate students admitted to passing the intermediate control (exam) in the academic discipline “The highest achievements' sport as a sphere of creative activity”, depending on whether they received final certification on it or not (%) (filling “strips” – graduate students, who received final certification in the subject “The highest achievements' sport as creative activity”, filling “bricks” – graduate students, who did not receive final certification in the subject “The highest achievements' sport as a sphere of creative activity”, filling “white color” – all graduate students admitted to passing the intermediate control (exam) in the academic discipline “The highest achievements' sport as a sphere of creative activity”; A – graduate students studying in full-time study (n = 21), B – graduate students studying in part-time education (n = 10), C – graduate students studying in all forms of education (n = 31))

Figure 5 shows the distribution of graduate students by gender and form of study. Block I refers to those, who have started mastering the distance course “The highest achievements' sport as a sphere of creative activity”, and allows us to conclude that the majority of those, who have begun, are male graduate students (about 89% for full-time studies and about 54% for distance learning). Most of the number of

female students who have started are postgraduate part-time students (46% versus 11% for full-time education). And in general, out of the number of newcomers, males are almost four times more (about 78%) than females (about 21%). Block II concerns those admitted to passing the intermediate control (exam) in the academic discipline “The highest achievements' sport as a sphere of creative activity” and duplicates the dependencies of Block I. Block III concerns those, who have received final certification in the academic discipline “The highest achievements' sport as a sphere of creative activity ”and allows you to determine, that the majority of those certified are full-time male graduate student students (about 88%) and female part-time students (about 57%). And in general, out of the number of certified males, there are almost three times more (about 74%) than females (about 26%).

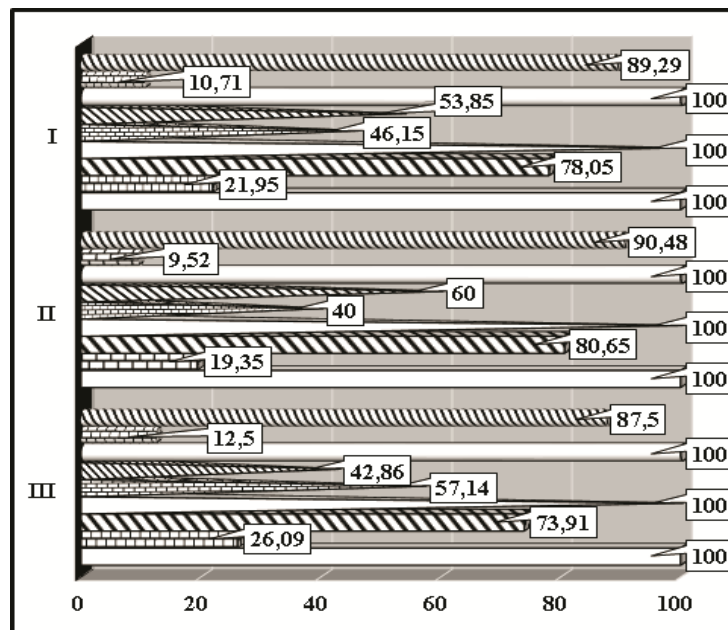


Figure 5. Distributions of graduate students, who began to master the distance course “The highest achievements' sport as a sphere of creative activity”, according to the criteria “gender” and “form of training” (%) (I – graduate students, who began to master the distance course “The highest achievements' sport as a sphere of creative activity”; designations for block I – filling “strips” and the form “full cylinder” – full-time male graduate students, filling “bricks” and the form “full cylinder” – female graduate full-time students, filling “white” and the form “full cylinder” – all full-time graduate students (n = 28); filling “strips” and the form “full pyramid” - male graduate students of extramural studies, filling “bricks” and the form “full pyramid” - female graduate students of extramural studies, filling “white” and the form “full pyramid” – all graduate students distance learning (n = 13); filling “strips” and the the form “rectangle” – male graduate students of all forms of study, filling “bricks” and the form “rectangle” – female graduate students of all forms of training, filling “white color” and the form “rectangle” – all graduate students of all educational forms (n = 41); II – graduate students admitted to passing the intermediate control (exam) in the academic discipline “The highest achievements' sport as a sphere of creative activity”; designations for block II – filling “strips” and the form “full cylinder” – full-time male graduate students, filling “bricks” and the form “full cylinder” – female graduate full-time students, filling “white” and the form “full cylinder” – all full-time graduate students (n = 21); filling “strips” and and the form “full pyramid” – male graduate students of extramural studies, filling “bricks” and the form “full pyramid” – female graduate students of extramural studies, filling “white” and the form “full pyramid” – all graduate students distance learning (n = 10); filling “strips” and the form “rectangle” – male graduate

students of all forms of study, filling “bricks” and the form “rectangle” – female graduate students of all forms of training, filling “white color” and the form “rectangle” – all graduate students of all educational forms (n = 31); III – graduate students, who have received final certification in the academic discipline “The highest achievements' sport as a sphere of creative activity”; designations for block III – filling “strips” and the form “full cylinder” – full-time male graduate students, filling “bricks” and the form “full cylinder” – female graduate full-time students, filling “white” and the form “full cylinder” – all full-time graduate students (n = 16); filling “strips” and the form “full pyramid” – male graduate students of extramural studies, filling “bricks” and the form “full pyramid” – female graduate students of extramural studies, filling “white” and the form “full pyramid” – all graduate students distance learning (n = 7); filling “strips” and the form “rectangle” – male graduate students of all forms of study, filling “bricks” and the form “rectangle” – female graduate students of all forms of training, filling “white color” and the form “rectangle” – all graduate students of all educational forms (n = 23))

Out of the number of graduate students, who received final certification in the academic discipline “The highest achievements' sport as a sphere of creative activity” (Figure 6), the majority of full-time graduate students eliminated debts in the 1st year (about 62%), while postgraduate students of extramural studies preferred to postpone the development of the discipline for the next (2nd) year of study (about 70%), despite the fact that the discipline was mastered within all forms of training in 1st semester.

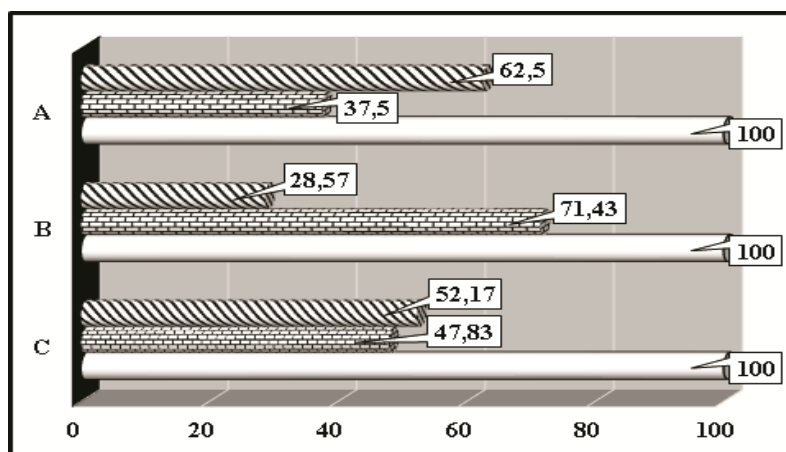


Figure 6. Distribution of graduate students, who received final certification in the academic discipline “The highest achievements' sport as a sphere of creative activity”, by the criterion “course” (%) (filling “strips” – 1st year graduate student students, filling “bricks” – 2nd year graduate students, filling “white” – all graduate students, who received final certification in the academic discipline “The highest achievements' sport as a sphere of creative activity”; A – graduate students studying in full-time study (n = 16), B – graduate students studying in part-time education (n = 7), C – graduate students studying in all forms of education (n = 23))

In addition, among the graduate students, who received the final certification in the academic discipline “The highest achievements' sport as a sphere of creative activity” (Figure 7), the majority of full-time graduate students received a rating of “satisfactory” (about 44%) and “good” (about 44%), while the majority of part-time graduate students received a rating of “good” (about 57%). The distribution of the sample of graduate students of all forms of study is characterized by a tendency identical to the sample of graduate students of correspondence courses (the rating is “good” – 48%).

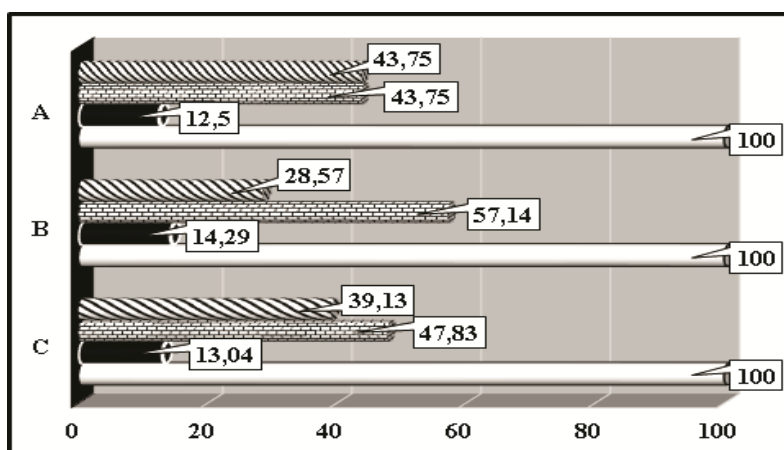


Figure 7. Distribution of graduate students, who received final certification in the academic discipline “The highest achievements' sport as a sphere of creative activity”, by the criterion of “assessment” (%) (filling “strips” – graduate students rated “satisfactory”, filling “bricks” – graduate students rated “good”, filling “black” – graduate students rated “excellent”, filling “white” – all graduate students, who received the final certification in the academic discipline “The highest achievements' sport as a sphere of creative activity”; A – graduate students studying in full-time study (n = 16), B – graduate students studying in part-time education (n = 7), C – graduate students studying in all forms of education (n = 23))

4.2. Results from explanatory statistics (analysis of contingency tables)

4.2.1. Analysis of contingency tables by the relationship “Form of education * Gender”

Direct relationship analysis (the form of education is the leading variable, gender is the dependent variable; Figure 8). Thus, it is shown, that among the full-time graduate students there are more male representatives (about 88%), while among the part-time graduate students there are more female representatives (about 57%).

Feedback analysis (the form of education is the dependent variable, gender is the leading variable; Figure 9). On the other hand, male graduate students generally prefer to study full-time (about 82%), while female graduate students prefer extramural studies (about 67%), which actually confirms and complements the direct relationship.

4.2.2. Analysis of contingency tables by the relationship “Course * Gender”

Direct relationship analysis (course is the leading variable, gender is the dependent variable; Figure 10). Obviously, among the graduate students, both 1st year and 2nd year, there are more males (almost 92% for 1st year versus almost 55% for 2nd year).

Feedback analysis (course is the dependent variable, gender is the leading variable; Figure 11). On the other hand, male graduate students predominantly constitute a 1st year group with arrears in the discipline “The highest achievements' sport as a sphere of creative activity” (about 65%), while female graduate students predominantly comprise a group of 2nd year debtors (about 83%), which allows us to

make a conclusion about the tendency of female graduate students to postpone the solution of educational problems for the future and complements the characteristics of the relationship in question.

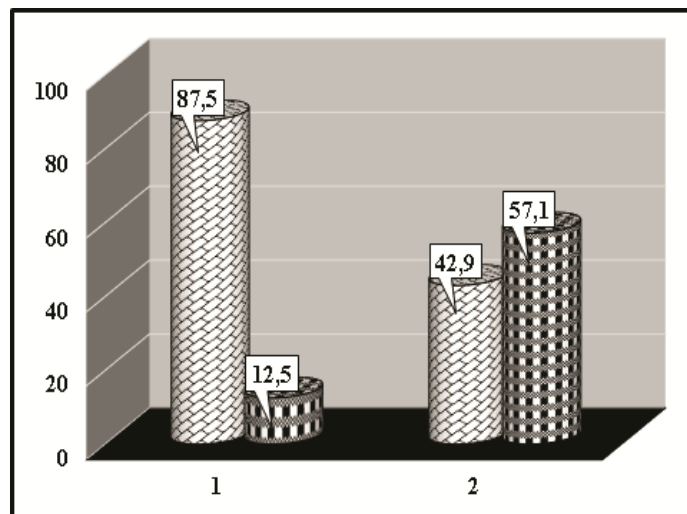


Figure 8. Analysis of the contingency table by the relationship “Form of education * Gender” from the determinant “Form of education” (direct relationship; %; $p \leq 0.05$; by the criterion of agreement X^2 Pearson with normalization of its value in relation to the size of the sample by criterion V Cramer) (filling “oblique bricks” – male graduate students ($n = 17$), filling “plaid” – female graduate students ($n = 6$); 1 – graduate students studying in full-time study ($n = 16$), 2 – graduate students studying in part-time education ($n = 7$))

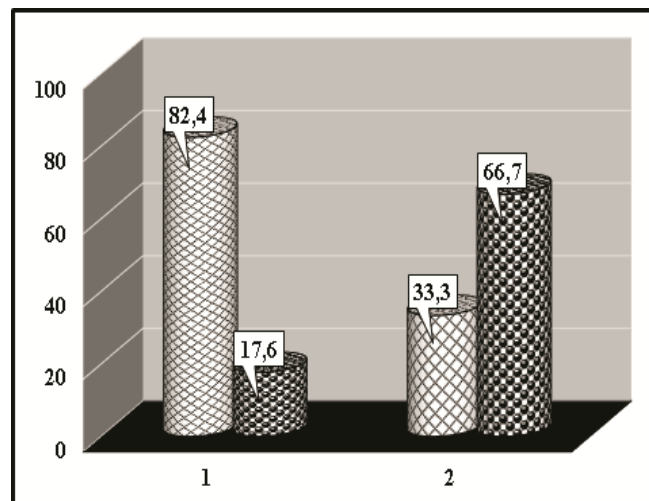


Figure 9. Analysis of the contingency table by the relationship “Form of education * Gender” from the determinant “Gender” (feedback; %; $p \leq 0.05$; by the criterion of agreement X^2 Pearson with normalization of its value in relation to the size of the sample by criterion V Cramer) (filling “oblique cell” – graduate students studying as part of full-time education ($n = 16$), filling “balls” – graduate students studying as part of extramural studies ($n = 7$); 1 – male graduate students ($n = 17$), 2 – female graduate students ($n = 6$))

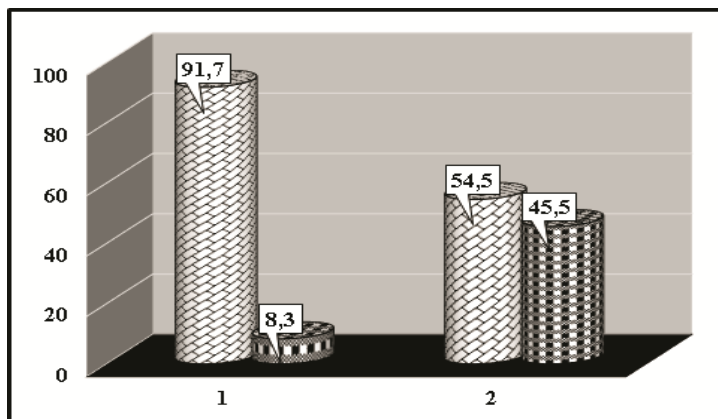


Figure 10. Analysis of the contingency table for the relationship “Course * Gender” from the determinant “Course” (direct relationship; %; $p \leq 0.05$; by the criterion of agreement X^2 Pearson with normalization of its value in relation to the size of the sample by criterion V Cramer) (filling “oblique bricks” – male graduate students ($n = 17$), filling “plaid” – female graduate students ($n = 6$); 1 – 1st year graduate students ($n = 12$), 2 – 2nd year graduate students ($n = 11$))

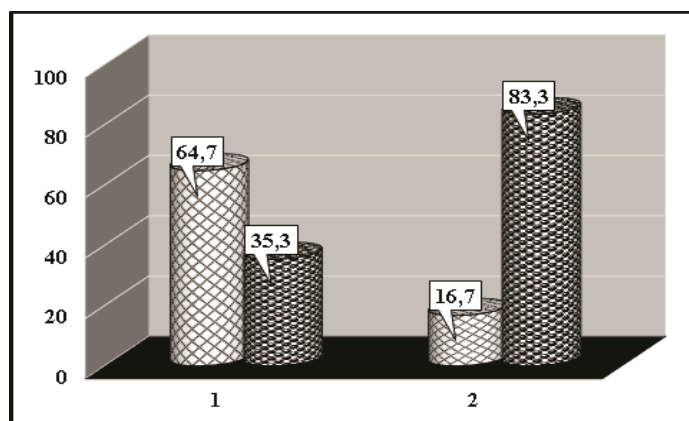


Figure 11. Analysis of the contingency table by the relationship “Course * Gender” from the determinant “Gender” (feedback; %; $p \leq 0.05$; by the criterion of agreement X^2 Pearson with normalization of its value in relation to the size of the sample by criterion V Cramer) (filling “oblique cell” – 1st year graduate students ($n = 12$), filling “balls” – 2nd year graduate students ($n = 11$); 1 – male graduate students ($n = 17$), 2 – female graduate students ($n = 6$))

4.3. Results from explanatory statistics (correlation analysis)

As a result of applying correlation analysis to scalar variables that determine the number of points received by graduate students ($n = 23$) for all tasks of the current control, and the total number of points in the academic discipline “The highest achievements' sport as a sphere of creative activity” (Figure 12), it is clear, that there is a very high positive correlation between them ($r = 0.942$). This dependence is stable, due to the fact that it persists when dividing all graduate students into subgroups depending on the selected criteria: when dividing by the form of study (Figure 13), the dependence is also relevant for graduate students studying in-person ($r = 0.972$), and for graduate students studying in absentia ($r = 0.964$); when dividing by the level of preparedness for graduate students certified in academic discipline not lower than for the assessment of “good” (Figure 14) – the dependence is relevant for graduate students certified in the

grade of “good” ($r = 0.917$), and for graduate students certified on the rating “excellent” ($r = 1$). The same dependence is preserved in two other cases, but for some of the options its character changes to the status “high” from the status “very high”, which also confirms our general conclusions: when dividing by gender (Figure 15), the dependence is also relevant for male graduate students ($r = 0.953$) and for female graduate students ($r = 0.812$); when dividing by course (Figure 16) – the dependence is relevant for both 1st year graduate students ($r = 0.872$) and for 2nd year graduate students ($r = 0.912$).

Also, based on the results of applying correlation analysis to scalar variables that determine the number of points received by graduate students for all tasks of the current control, and the number of points received by graduate students for passing the intermediate control (exam) in the academic discipline “The highest achievements' sport as a sphere of creative activity” (Figure 17), it is clear, that between them there is a high negative correlation when dividing by the level of preparedness: for graduate students certified to be “satisfactory” ($r = -0.786$), and for graduate students, at Tested for a rating of “good” ($r = -0.741$). Thus, it can be argued that graduate students, who do not aspire to the maximum assessment of their knowledge, skills, possessions and competencies formed during the development of the academic discipline “The highest achievements' sport as a sphere of creative activity”, prefer either to complete more tasks of current control and, at the same time, it's worse to prepare for passing the intermediate control, or, on the contrary, to perform fewer tasks of the current control, but it is better to prepare for passing the exam. In other words, they are not characterized by the performance of both activities at a high level (on the contrary, the performance of both activities at a minimum level is also not typical, most likely due to the fact that they do not lead to the successful completion of the academic discipline as a whole).

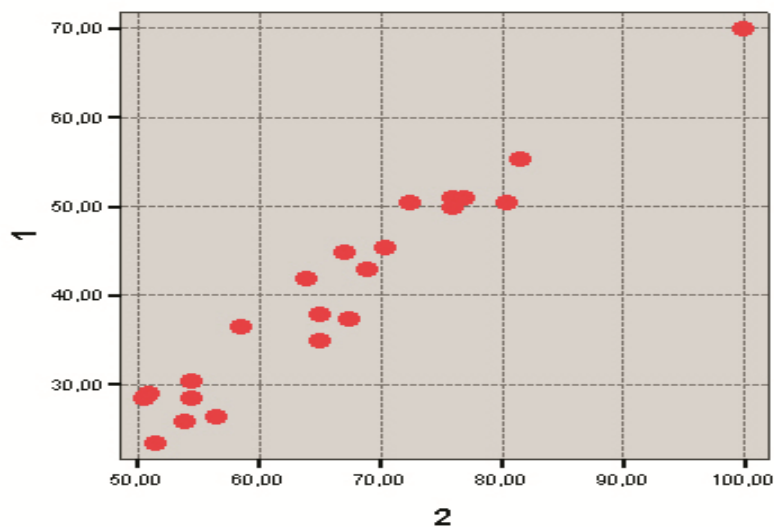


Figure 12. The scatter chart, showing a significant very high positive correlation between the number of points obtained for all tasks of the current control and the total number of points in the academic discipline “The highest achievements' sport as a sphere of creative activity” ($n = 23$; points; $p \leq 0.05$; by Spearman's rank correlation coefficient) (1 – the number of points obtained for all tasks of the current control, 2 – the total number of points in the academic discipline “The highest achievements' sport as a sphere of creative activity”)

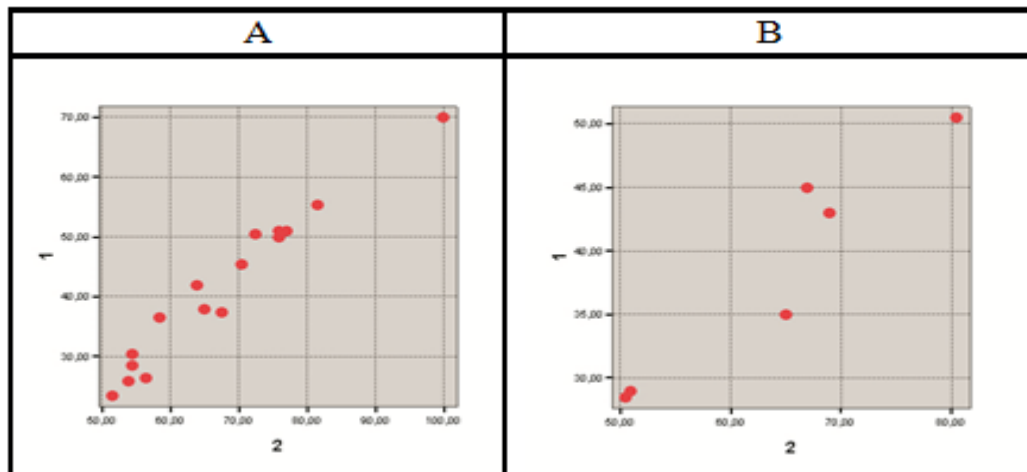


Figure 13. The scatter chart, showing a significant very high positive correlation between the number of points obtained for all tasks of the current control and the total number of points in the discipline “The highest achievements' sport as a sphere of creative activity” (points; $p \leq 0.05$; by Spearman's rank correlation coefficient) (1 – the number of points obtained for all tasks of the current control, 2 – the total number of points in the academic discipline “The highest achievements' sport as a sphere of creative activity”; A – graduate students studying in full-time study (n = 16), B – graduate students studying in part-time education (n = 7))

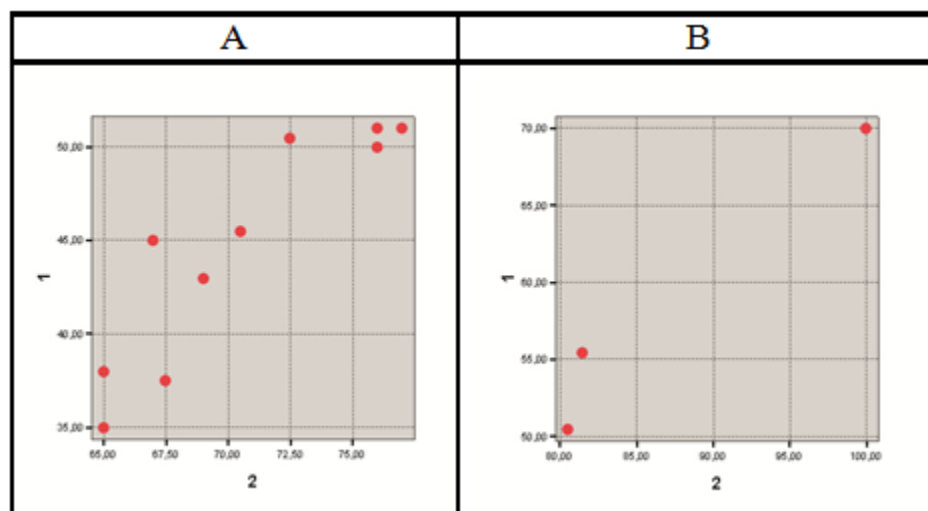


Figure 14. The scatter chart, showing a significant very high positive correlation between the number of points obtained for all tasks of the current control and the total number of points in the academic discipline “The highest achievements' sport as a sphere of creative activity” (points; $p \leq 0.05$; by Spearman's rank correlation coefficient) (1 – the number of points obtained for all tasks of the current control, 2 – the total number of points in the academic discipline “The highest achievements' sport as a sphere of creative activity”; A – graduate students certified to be rated “good” (n = 11), B – graduate students certified to be rated “excellent” (n = 3))

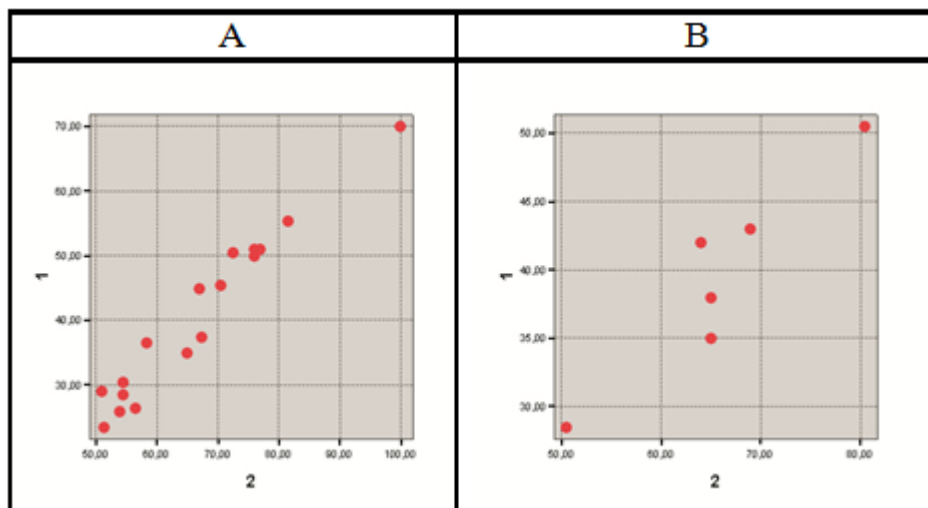


Figure 15. Scatter chart showing a significant very high / high positive correlation between the number of points received for all tasks of the current control and the total number of points in the academic discipline “The highest achievements' sport as a sphere of creative activity” (points; $p \leq 0.05$; by Spearman's rank correlation coefficient) (1 – the number of points obtained for all tasks of the current control, 2 – the total number of points in the academic discipline “The highest achievements' sport as a sphere of creative activity”; A – male graduate students (n = 17), B – female graduate students (n = 6))

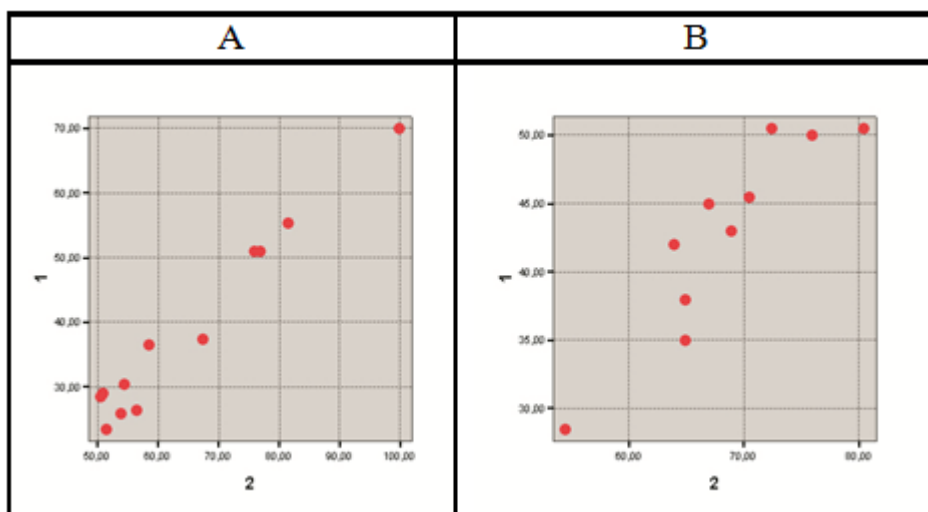


Figure 16. Scatter chart showing a significant high / very high positive correlation between the number of points received for all tasks of the current control and the total number of points in the academic discipline “The highest achievements' sport as a sphere of creative activity” (points; $p \leq 0.05$; by Spearman's rank correlation coefficient) (1 – the number of points obtained for all tasks of the current control, 2 – the total number of points in the academic discipline “The highest achievements' sport as a sphere of creative activity”; A – 1st year graduate students (n = 12), B – 2nd year graduate students (n = 11))

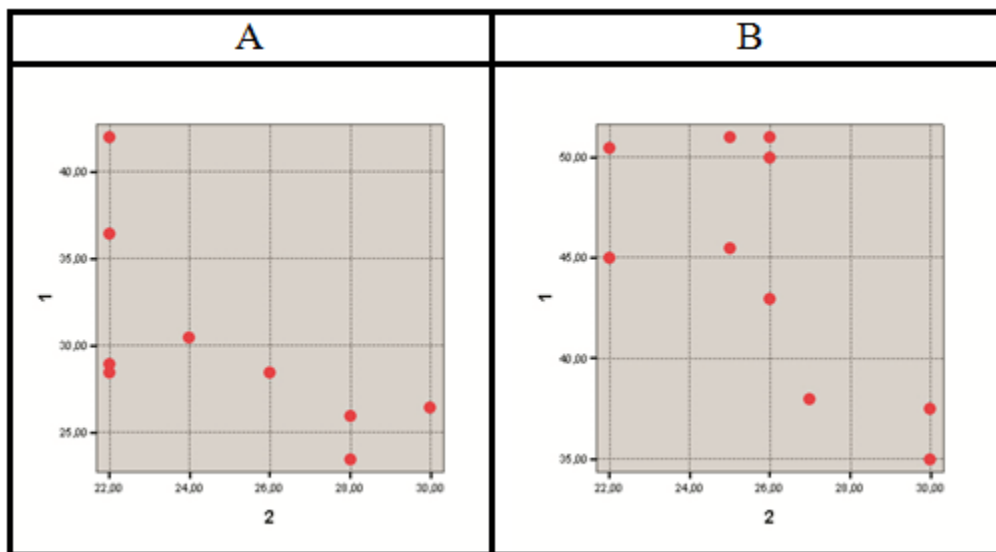


Figure 17. The scatter chart, showing a significant high negative correlation between the number of points received for all tasks of the current control and the number of points received by graduate students for passing the intermediate control (exam) in the discipline “The highest achievements' sport as a sphere of creative activity” (points; $p \leq 0.05$; by Spearman's rank correlation coefficient) (1 – the number of points obtained for all tasks of the current control, 2 – the number of points obtained for passing the intermediate control (exam) in the academic discipline “The highest achievements' sport as a sphere of creative activity”; A – graduate students certified as “satisfactory” ($n = 9$), B – graduate students certified as “good” ($n = 11$))

5. Conclusion

Thus, the digital format for the development of educational material allows the teacher to form the competencies of graduate students in the field of physical culture and sport in full, giving them the opportunity to plan educational routes taking into account their interests and ambitions for the final level of mastering the discipline (threshold, intermediate or advanced).

6. The discussion of the results

Therefore, the methodological approach to the development and implementation of the distance course “The highest achievements' sport as a sphere of creative activity” can be considered as an example of the effective development and implementation for other distance courses.

This methodological approach is based on the following provisions:

- the graduate student must complete the relevant tasks of current control for all sections of the discipline;
- there should be tasks of current control of a research nature; in the case, when the task involves summarizing the information, the task itself should be two-step – after checking the result of the review, the graduate student is asked to fill out a table with problematic “columns” for the control questions chosen by the teacher;
- there should be tasks of the current control of a research nature, involving the implementation by the graduate student of creative developments;

- all classroom types of assignments (used in the traditional format) here are transformed into a two-stage format: initial written development followed by filling out a table with problematic “columns” for control questions chosen by the teacher;

- without the obligatory passing of the intermediate control, the points for completed tasks of the current control are not counted (it is impossible to automatically get the marks “satisfactory” or “good”).

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