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Research article

The Impact of Technology on Improving the Learning Process in Physical Education Lessons for Medically-Exempt Pupils

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Abstract: ***Background and Study Aim.*** The focus of our attention lies on the medically exempt students, who more often than not take part in physical education (P.E.) classes as spectators, without any tasks to complete in accord with the collective work of their classmates or the objective of the lesson. The purpose of the present research is to develop and implement the application Info-Scutit-Sport in the P.E. lesson to the purpose of teaching and assessing medically-exempt students, who are present, but do not take part in the lesson. ***Material and Methods.*** The present paper emphasises the usefulness of the Info-Scutit-Efort [Info-Exempt-Effort] application aimed at the active and mindful inclusion of 55 students (aged=11.29±1.84), who have a medical exemption (58.2% total and 42.8% partial) in the P.E. lesson. The application, in an improved form, comprises the entire content of the curriculum of physical education in secondary school, transformed into 2080 questions with three answer variants, with 1500 processed images, that may be accessed with the teacher's accord, on the student's own phone. The assessment obtained by means of the application after the working session may provide the student with a mark for the information taught before, if he accesses topics from the previous lessons, or a mark for the current assessment in order to test the active and mindful participation in the lesson which is being taught. ***Conclusions.*** The study utilized multiple statistical tests to establish a relationship between platform access time and student performance. The results of the tests demonstrated that platform use time has a significant impact on student performance, with longer platform access time leading to higher marks. The study concluded that the proposed model is significant, as it identifies platform access time as a crucial factor in determining student performance. Moreover, the study found that even small increases in platform access time can lead to significant improvements in student performance, with an increase of one unit resulting in a 0.54% increase in marks.

Keywords: medically-exempt students, physical education (P.E.), quiz application, health, learning, innovative teaching methods,

1. Introduction

The Methodology of organization and deployment of sport and physical education activities in pre-university education sees as the main function the optimization of the students' health by finding various means, as well as distinct materials, methods, and technologies in accordance with the students' peculiarities, irrespective of their level of fitness or physical skills [1].

Our attention is focused on the medically-exempt student, who participates in the gym class mainly as a spectator, not having any tasks to complete in relation to the classmates' collective work or the topic of the lesson. By the nature of their activity, teachers have to address situations when decisions need to be made on the spot, like exempting from effort the students who complain of a momentary pain. There are two categories of effort-exempt students who do not effectively participate in effort-making, i.e. students with a clear diagnosis and medical recommendations, and students experiencing some sort of pain or discomfort during the P.E. lesson.

According to the Methodology of issuing medical exemption certificates, as well as the Medical Standard of conditions prompting the issuance of medical exemptions from sport and physical education classes [2], there is a total of 371 types of diagnoses, classified into 15 large groups of medical conditions.

In a previous paper[3] we presented a version of the application aiming at finding solutions for the active and mindful integration of the exempt students all through the lesson. Although the number of medically-exempt students is on the increase, and the physical education teachers are aware of the issue, there are no known nationally-coordinated educational programs or strategies able to solve the "passive spectator attendance" in the lesson.

The activity of the medically-exempt students during the lesson usually boils down to sitting on a bench away from the rest of the class, away from the teacher's explanations and demonstrations, isolated and self-excluded due to their inability to exercise and the teacher's impossibility to divide his/her attention between the class and the physically inapt at the same time.

Irrespective of the exemption type, i.e.total or partial, the student is excluded from the lesson tasks for a certain duration, and being on the bench s/he definitely loses any interest in the lesson, and gradually accumulates theoretical knowledge gaps, which will ultimately result in motor acquisition development gaps.

Specialized literature is quite scarce in regard to the means used during the lesson for the medically-exempt students, as the focus is always on the physically apt students, who are actually able to participate in physical effort. A brief perusal of the methodology of organization and deployment of sports and physical education activities in pre-university education shows that the student in question may perform organization tasks such as arranging sports materials, refereeing, measuring, recording technical elements [2].

Healthcare, physical education, and sports specialists present data, evaluations, and solutions regarding the practical issues of engaging students with special educational needs[4] and adults who engage in moderate physical activity, with the aim of improving quality of life[5–7].

Specialists in the field of sports and physical education focus on data, assessments and solutions regarding the problems of teaching physical activity to students with special needs aimed at improving the quality of life.

In China, students with cardiovascular conditions, obesity and diabetes improved their health by practising physical exercise in a program that was part of an experiment based on the "Deep Learning" method [8], and a study on the medically-exempt students enrolled in the "Carol Davila" University of Medicine and Pharmacy in Bucharest highlights the importance of an individualised working program structured according to the

medical condition category, so that the student could be integrated into the group perform-ing the physical effort but at a different intensity [9].It is worth noting that the teacher faces difficulty in working simultaneously at the same level both with apt students and students with partial or temporary exemptions, no matter how prepared s/he is, or how much s/he would like to. There are no known individualised teaching or assessment programs for the students with short-term effort exemptions that are actually being implemented in the P.E. class [10].

A study including 544 teachers underlines the importance of finding the right teaching tools through the support of institutional management, so that to stimulate the student's motivation in direct relation with the teacher's motivation, in order to remove the burnout phenomenon [11].

A study of student groups evaluating students from a somatoscopic point of view proves that light forms of kyphosis, lordosis, kypho-lordosis, scoliosis and other ailments may be improved by programs initiated and monitored by P.E. teachers in relation to the medical directions from the sports physicians [12–15]..

There are studies evincing serious flaws in the field, i.e. most diagnoses on the students' medical certificates arouse the teachers' suspicions, especially when physicians recommend total effort exemption without specifying data about adapting the effort to the diagnoses in question.

A study carried out on 30 students partially exempt from effort present the efficiency of the special gymnastics programs, which are attractive and accessible, especially conceived for motor and functional improvement yielding significant results in improving the vital capacity and static balance [14- 15].

It is common knowledge that there is a connection between the students' negative attitude to effort and the reason why they bring an exemption from P.E. classes, and there is a possibility that exemptions are issued with no real grounds for minor conditions, according to articles in Latvia [14].

Many specialised articles warn against the increasing number of young people with motor issues, who do not exercise, but there is no provision of solutions that could be followed through from secondary school to higher education levels [17–19].

The lack of motivation and interest may be decreased by using technology (simulators, quiz applications, coordination games, smart watches) able to assist in forming knowledge, competences and abilities in the medically-exempt students while they are ex-empt from P.E. class [21-22].

Due to the desire to create physical education lessons tailored to the student's needs, in order to increase the participation level and motivation even in the case of a medically-exempt student, the present paper wishes to be another step towards achieving this objective.

By implementing the software quiz application (Info-Scutit-Efort) into the lesson, conveying theoretical knowledge may be improved by covering the fields of interest so that the student is stimulated to take an active part for a longer time in the P.E. lesson.

The need for the use of electronic educational programs through multimedia packages within the area of motor activities is also focused on by research from Egypt, China and Uzbekistan [25–29].

A study including 240 students, out of whom 40 had medical exemptions from PE classes, highlights, through the results obtained in non-verbal neuropsychological tests (the Brown non-verbal intelligence test, the Corsi block-tapping test, the Benton visual retention test), the importance of mental representation through visual and kinaesthetic motor images [30] during teaching, in the physical education assignments, as well as high performance sport.

In ample research discussing the reform in physical education [31] through 5G technologies, the students seem ever more thrilled and more interested in participating in PE lessons when traditional means and methods are combined with modern methods aided

by smart devices [27,32]. The existence of applications, innovative programs, virtual private networks, motion simulators in the gym may give rise to criticism, but it is better to analyse the positive reaction and fast response to students' involvement in physical tasks [26,33,34].

Purpose of the Study. The purpose of the present research is to develop and implement the application Info-Scutit-Sport in the P.E. lesson to the purpose of teaching and assessing medically-exempt students, who are present, but do not take part in the lesson.

Our research aims to verify the following directions:

1. The use of the Info-Exempt-Effort application in physical education classes may encourage medically exempt or physically unfit students to actively and mindfully participate for longer periods, thus facilitating the transmission of competencies more effectively.
2. The possibility of assessment and self-assessment through the application may be appealing enough to medically exempt students to ensure that while they are resting on the bench, they are guided towards information within the subject scope and achieve better grades at the end of the working session.

Materials and Methods

Participants. The subjects of the present study were 55 secondary school students (aged 11.29±1.84), who were medically exempt (58.2% totally and 42.8% partially), and used the application during PE classes with the approval and support of their teachers. They used the application according to either the topic being taught in class in real time, or to the topics previously taught, in order to self-assess, gather information, and also compete in cases where more than one student had exemption from PE class at the same time. The number of the subjects tested was low as each class generally comprises one, or a maximum of two effort-exempt students, and the application is not yet free online, being in the testing and certification stage.

Regression models are used to describe the relation between two or more variables. First and foremost, in order to estimate a relation, we have to identify the type of function connecting the independent variable to the dependent one. The condition to meet is that the function should be liniar or at least liniarized. Such a function looks as follows:

$$y_t = a_0 + a_1 * x_{1t} + a_2 * x_{2t} + \cdots + a_k * x_{kt} + \varepsilon_t,$$

where: y_t is the dependent variable, a_0 – the intercept specifying the value of y, if x were 0, a_i – the model parameters, which are to be estimated by the smallest squares method, and x_{it} – the independent variables of the model, and ε_t – the random variable or the error. The purpose of regression models is to make the best possible estimation of the relation between the dependent variable and the independent variables, which may be performed by means of the statistic hypotheses that have to be checked in the process. Such a regression model was used in the present paper to identify the relation between the dependent variable (the mark obtained after accessing the platform) and the independent variable (the platform access time). Analysing the relation between these two variables, it was found that it is a nonliniar power-type function which was liniarized by applying the logarithm function.

Research Design. The Info-Scutit-Efort application was created and developed at the Center of Research for Human Performance within the Faculty of Sports and Physical Education in Galati, in November 2021-February 2023.

For the present paper the data on the use of the application implementation were collected from December 2022 to February 2023 with the assistance of PE teachers. Medically-exempt students who tested the application during their P.E. classes were the students who did not take part in the classroom activities anyway, so that they were asked whether they wanted to access the application, and any mention of additional information was deliberately avoided in order to observe the use flexibility and accessibility.

The application recorded the actual working time of the students, and in order to evince

the acquisition of theoretical knowledge, the calculations took into account the mark scored for the final working session for each student.

The study stages are in agreement with the Helsinki declaration, and observe the deontological rules of research on human subjects. Regarding the technical details of the application created [3] and updated in this article, it is necessary to also add the presentation of the resources needed in creating the quiz type application: the Multi Platform Unity software [31], the free Visual Studio program [36], the Microsoft Visual Studio Code 2019 program [20], the Mono platform [33] and the Adobe Photoshop editor [38]. The three-level architecture consists of: user interface; integrated development medium; structure of the programming code.

Figure 1 shows the components of the application, the manner of use and the advantages that this application provides when used during the PE class only for the partially or totally effort-exempt students.

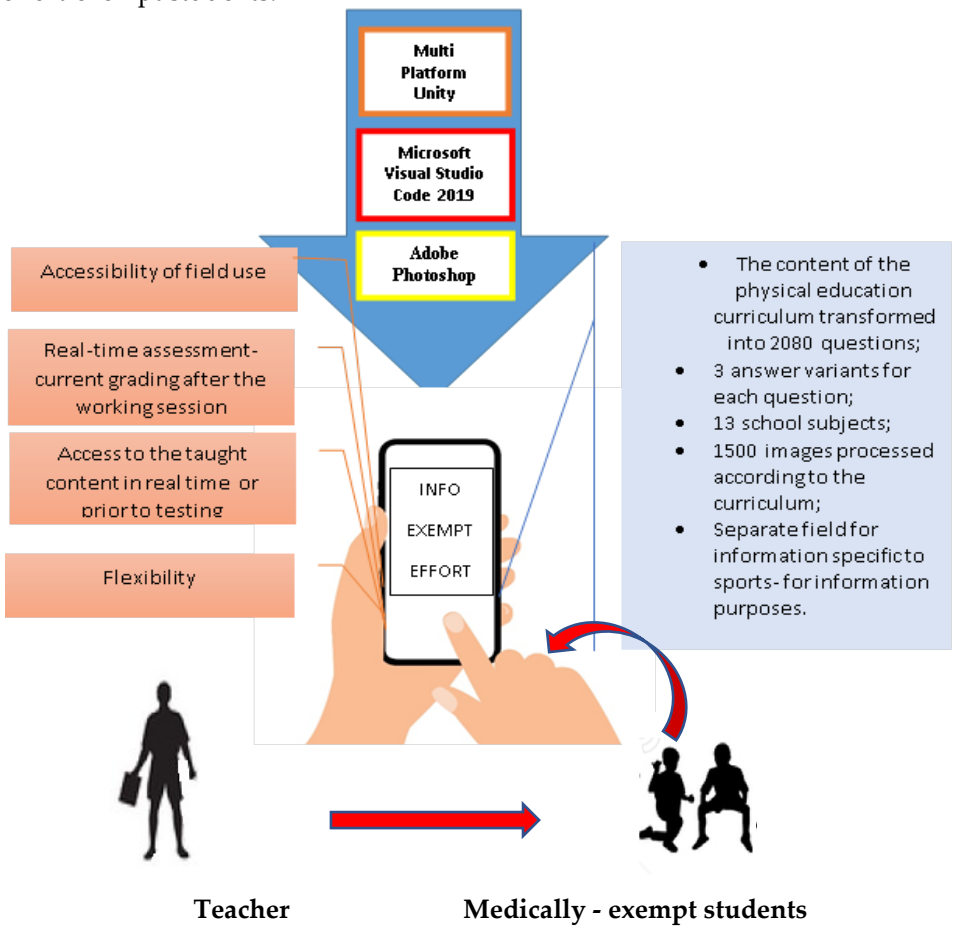

Figure 1. Components of the Info-scutit-effort application

The Microsoft Visual Studio 2019 program was used to create all the scripts in the application interface. After implementing the Unity platform for the quiz app, the application can be utilized on various devices, including Android devices with a minimum version of 4.4 KitKat, iOS devices, and other operating systems within the Universal Windows area, regardless of the installed version. Additionally, the app is compatible with Linux operating systems. The main menu holds significant importance within the user interface as it serves as the initial point of interaction for teachers and students upon launching the application.

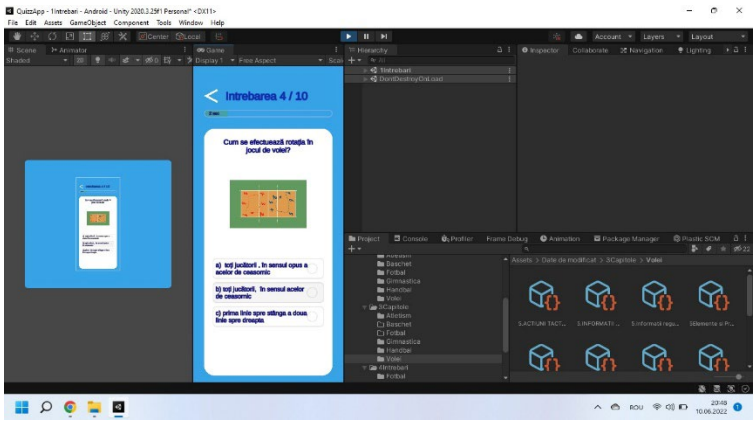

Figure 2. Screenshot of the Unity platform-working session

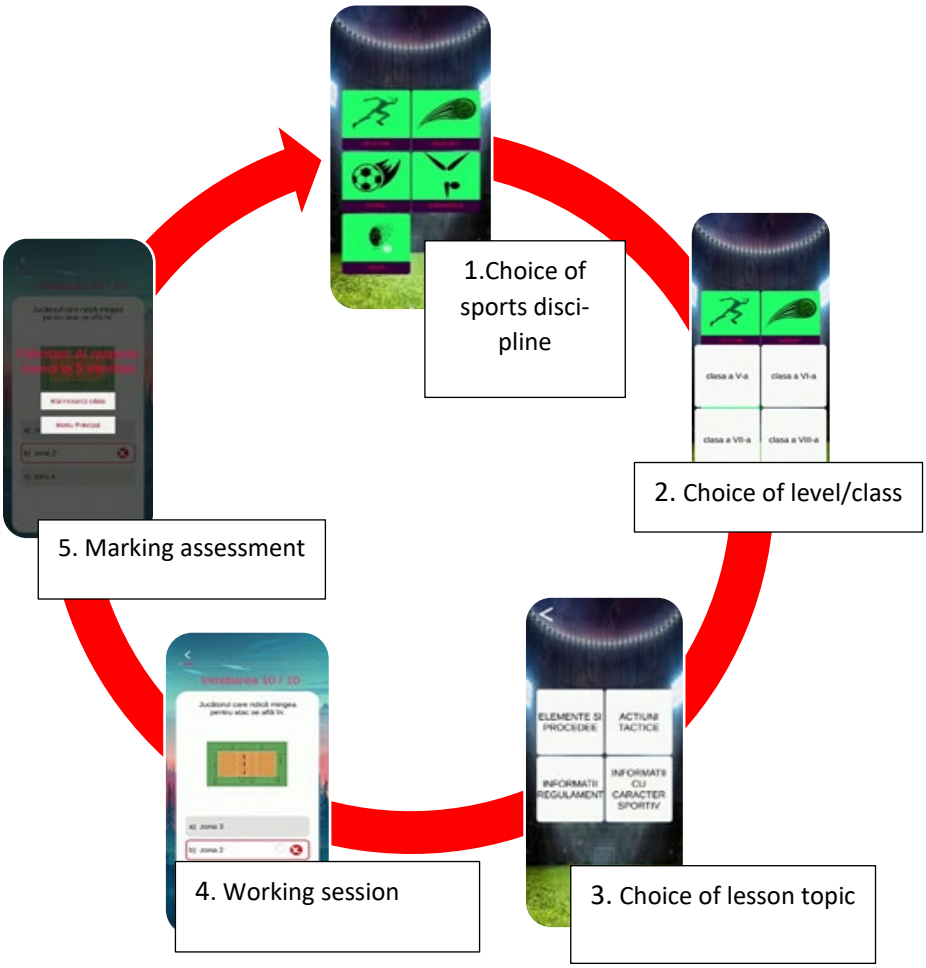

Figure 3. Stages of a working session on the Info-Scutit-Efort application

To understand how accessible the application is, we present the following steps:

1. The medically-exempt student, with the teacher's consent, accesses one of the sports disciplines presented in the application, usually the discipline or sports game that is being taught at that particular time in class. S/he has the opportunity to first listen to the topic of the lesson (from the introduction, consolidation, etc.) and then to perform a self-assessment by accessing the work session on the same topic discussed in the gym hall.

2. The student selects the level, according to his or her own estimate, respectively, s/he selects the 7th grade if s/he is in the 7th grade. Students may also access lower levels, as they contain already learned material, and thus they may easily perform self-assessment.
3. The student selects the topic from the folders "Technical elements and procedures", "Technical-tactical Actions", "Regulations", and "Sports-related information", which may be indicated by the teacher, if they want to integrate the student in the learning process. For example, the teacher may ask the medically-exempt student, who is benched anyway, to access the "Regulation" folder and, after 2-4 working sessions, the student may be integrated into the lesson as an adjunct referee, on the basis of the information s/he has accessed in the application. The student may access the menu for information purposes only if they want to read sports-related facts without going through a graded working session.
4. The working sessions contains 10 questions with 3 choices of answer each, only one being correct. Each working session presents processed images which help in the accurate understanding of contents. The correct answers are immediately highlighted in green, whereas the wrong ones are highlighted in red.
5. Grading – at the end of the ten questions in the working session, the final grade is provided, each correct answer amounting to 1 point. A message such as "Congratulations, you had 9 out of 10 correct answers!" means that the student got a 9.

Statistical Analysis

Estimating the parameters of the model we proposed in the paper, as well as testing the statistical hypotheses in connection to the estimations were performed by means of the Eviews 8 tool.

In order to show in the first place that there is a relation between the platform access time variable abnd the mark obtained by the pupil we used several tests: the Kolmogorov-Smirnov test and the Shapiro-Wilk test to prove or disprove the normal distribution of the values of the two variables, and the Mann-Whitney U test to confirm or infirm the impact of platform access time upon the mark. All these statistical tests were checked by means of the SPSS 23 statistic tool. It was proved that the platform use time influences the mark, as according to the Mann-Whitney U test, distributing the values into two situations (use of up to 15 minutes and use of over 15 minutes) may result in a lower or higher mark.

Results

Prior to determining the impact of the platform access time on the mark obtained, a series of tests are to be performed.

The actual key pressing time and field use time of the app were recorded, and the series of data of the access time was transformed into a nominal variable by redistributing the values in two classes: the reduced use of the platform (the selected access time was between 0 and 15 minutes) and high access time (the length of access between 16 and 50 minutes). the next step was testing the series normality, as normal data are a basic hypothesis in parametric testing. The normality check was performed by the Kolmogorov-Smirnov and the Shapiro-Wilk tests, for which two hypotheses were formulated: the null hypothesis (H_0) where the series are normally distributed, and an alternative hypothesis (H_1) through which it is specified that the series are not normally distributed. Upon applying the two tests (Table 1), the alternative hypothesis was accepted.

Tabel 1. Normality Test

Tests of Normality

	Access_time_interval	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Grade_after_access	Reduced access time	.298	16	.000	.846	16	.012
	High access time	.269	39	.000	.858	39	.000

a. Lilliefors Significance Correction

As the series are not normally distributed, the Mann-Whitney U test is used to see if there is a relation between the two variables. As in any check-up test, two statistical hypotheses are formulated: the null hypothesis specifying that there is no difference between the two population groups, and the alternative hypothesis specifying that there is a difference between the two population groups. Upon applying the test the conclusion reached was that the null hypothesis is rejected, and the alternative hypothesis is confirmed, that is these data may bring about a difference in the mark obtained by those who use the platform for a short length of time and those for whom the access time is longer (Table 2 and Table 3).

Table 2. The Mann-Whitney-U test

Null Hypothesis	Test	Sig.	Decision
The distribution of Grade_after_access is the same across categories of Access_time_interval.	Independent-Samples Mann-Whitney U Test	.000	Reject the null hypothesis

Asymptotic significances are displayed. The significance level is .05.

Table 3. The effect of access time on the mark

Group	Test	N	Mean rank	Sum of ranks	Mann-Whitney U	Z	Sig
Reduced time access	Grade	16	9.50	152	608.00	-5.664	.000
High access time		39	35.59	1388			

As for the effect of the Mann-Whitney U test, it is a strong one, as its value is over 0.5.

After proving the existence of a relation between the platform access time and the mark obtained by pupils, its impact is also determined. Analysing the data obtained for the 55 pupils, it is observed that the two variables display a nonliniar connection, expressed by a power-type function.

Upon applying the smallest squares method on the function, as well as checking the statistic hypotheses at the basis of assessing the parameters of the econometric model, the following model was obtained:

$$\log(grade) = \underset{(4.64)}{0.52} + \underset{(14.03)}{0.54 * \log(access\_time)} \quad R^2=78.78\%$$

Discussion

Analysing some of the articles in the literature, we note that on an international scale, there is a plethora of software solutions, methodologies tailored to the diagnosis of the learner that ensure continuity in skill transfer and acquisition. Technology and modern learning and assessment methods have increasingly contributed to the realization of progress in various fields. In performance sports, some coaches and athletes have been using devices in their work that stimulate interest in analysing movement, measuring effort, determining progress, assessing health, recovering from injury, etc. [39–42]. In Turkey, a research conducted on 229 students highlights the link between sports practice and the level of happiness of the performers, and another research conducted in Malaysia on primary school students highlights the importance of the teaching and learning process in relation to the student's level of understanding, learning, satisfaction and enjoyment of performing motor acts. At Oxford University, UK, students who for various reasons cannot perform motor tasks during physical education classes are engaged in low-intensity physical activity, monitored with accelerometers to objectively measure the intensity of their effort, and compare it with the subjective side of effort. The authors analysed a group of 76 students and examined the relationship between exertion and behavioural response to activity.

The extensive article, in a sub-chapter, highlights the importance of workload in shaping behaviour towards physical activity, with the authors concluding that when students do not have workloads, not only is their learning potential impaired, but also that of their peers [40]. This idea perfectly showcases our research topic, as we also consider that the medically-exempt students, who have no tasks during the class that takes place in front of them, will have difficulties in recovering both the theoretical and practical part when they will be fit for the effort and moreover, this will also affect the activity of their teammates in the joint performance of game tasks, the joint activity in the working formations. Innovation, the use of technology in physical activity is often on the borderline between being accepted or rejected by teachers.

However, the conceptual physical education classes have proved their usefulness in kinesiology, and may also be employed in the PE class, as they build solid knowledge and motivation for physical activity among students [43].

Students who actively participate in lesson sequences are able to optimize their deep learning mechanism, especially when they also have positive feedback from teachers in each lesson. he main factor affecting the student's active participation is the lack of interest and motivation for the lesson, the topic, the physical education task [8].

Research findings show that students are more interested in using apps in any field, and that they no longer want methods based on pen-and-paper work [44–46]. If the student in question feels that s/he is left alone on the bench, far from their peers during the medical exemption period, then s/he will be demotivated and even excluded. It would be helpful to have these programs or apps used in the P.E. lesson, both for medically-exempt students and for teachers who have to put extra effort into integrating them into the lesson. Teachers have to look for solutions to keep students active, interested, motivated in the lesson through different methods, and we propose just this kind of application that can help, reinforcing at least the theoretical knowledge during the medical exemption.

For the time being, in our country, there are no known methodologies to be applied for medically-exempt students in order to integrate them, to get them to participate actively in a physical way in the lesson.

A student with a total exemption can certainly achieve a set of tasks that will ensure, at the time of recovery, rapid integration in physical exercises, in the organization on the field of sports games, in the assimilation of the rules of the game or in the mental training of

motor skills. It would be a success for our field if there were a well-thought-out methodology whereby the medically exempt student could perform a minimum amount of effort recommended by the exempting physician, under the guidance and supervision of the classroom teacher.

In our future development plan for this application, we want to work with sports physicians to recommend and indicate exercises for each group of conditions (outlined in the Medical Exemption Release Chart) so that the medically-exempt student can follow the (remedial) exercises during the physical education lesson by accessing the diagnosis-specific exercise set from the app. The P.E. teacher could only follow the correct execution/performance of the exercises recommended by the doctor, which the medically-exempt student would access in the app.

This will drastically reduce the number of students who are benched and not integrated into the effort because of their diagnosis. Collaboration between the sports physician and the physical education teacher based on a methodology and the use of an application would help and actively integrate the medically-exempt student.

Conclusions

Two main observations can be drawn from this study: The study utilized multiple statistical tests to establish a relationship between platform access time and student performance. The results of the tests demonstrated that platform use time has a significant impact on student performance, with longer platform access time leading to higher marks. The study concluded that the proposed model is significant, as it identifies platform access time as a crucial factor in determining student performance. Moreover, the study found that even small increases in platform access time can lead to significant improvements in student performance, with an increase of one unit resulting in a 0.54% increase in marks.

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Informed Consent Statement: All investigated students agreed to participate in the study.

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References

1. http://www.monitoruljuridic.ro/act/ordin-nr-3-462-din-6-martie-2012-privind-aprobarea-metodologiei-nbsp-organiz-rii-i-desf-ur-rii-activit-ilor-de-educa-ie-fizic-i-sport-n-nv-m-ntul-preuniversitar-emitent-136273.html (accessed on 21 July 2022).
2. Systems, I. Ordinul nr. 204/2007 pentru aprobarea Metodologiei privind eliberarea scutirilor medicale de la orele de educaţie fizică şi sport pentru elevi şi studenţi şi a Baremului medical cuprinzând afecţiunile pentru care se acordă scutirile medicale de la orele de educaţie fizică şi sport Available online: https://lege5.ro/Gratuit/geydqmrxge/ordinul-nr-204-2007-pentru-aprobarea-metodologiei-privind-eliberarea-scutirilor-medicale-de-la-orele-de-educatie-fizica-si-sport-pentru-elevi-si-studenti-si-a-baremului-medical-cuprinzand-afectiunile- (accessed on 21 July 2022).

3. Pârvu, C.; Harabagiu, N.; Alistar, G.D. Integration of Medically-Exempt Students in the Physical Education Class by Implementing a Quiz Application Created According to the School Curriculum. *Balneo and PRM Research Journal* **2022**, *13*, 514, doi:10.12680/balneo.2022.514.
4. Ungurean, B.; Cojocariu, A.; Abalașei, B.; Popescu, L. Analysis of Morphological Parameters and Body Composition in Adolescents with and without Intellectual Disability. *International Journal of Environmental Research and Public Health* **2023**, *20*, 3019, doi:10.3390/ijerph20043019.
5. Elena, V.; Constantinescu, M. Comparative Study on the Importance of Physical Activity on Body Composition in Adults. *Balneo and PRM Research Journal* **2022**, *13*, 530, doi:10.12680/balneo.2022.530.
6. Szabo, D.A.; Neagu, N.; Csatlos, A.T.; Banceu, C.; Oprean, M.; Banceu, D. The Use of Corehab Riablo Medical Software in Primary Kinetic Prophylaxis. *Bulletin of the Transilvania University of Braşov. Series IX: Sciences of Human Kinetics* **2022**, 89–98, doi:10.31926/but.shk.2022.15.64.2.10.
7. Fahim, T.; Virsanikar, S.; Mangharamani, D.; Khan, S.; Mhase, S.; Umate, L. Physiotherapy Interventions for Preventing Spinal Curve Progression in Adolescent Idiopathic Scoliosis: A Systematic Review. *Cureus* **2022**, *14*, doi:10.7759/cureus.30314.
8. HaitaoHAO; Sbeih, A.; Shibly, F.H.A. Physical Education and Its Role in Improving the Health of College Students by Active Participation and Optimization by Deep Learning. *Aggression and Violent Behavior* **2021**, 101628, doi:10.1016/j.avb.2021.101628.
9. MITU, D.C.; NEAMȚU, M.; TUDOR, M.; TUDOR, I.-D. Motivational Aspects Regarding Participation in Physical Education Classes of Students with Partial Medical Exemption. In Proceedings of the Book of Proceedings of the 10th International Congress of Physical Education, Sport and Kinetotherapy; 2020; pp. 95–105.
10. Ungurean, B.C.; Cojocariu, A.; Oprean, A. The Use of Dynamic Games in the Development of Motor Skills among Children with Special Educational Needs. *Timisoara Physical Education and Rehabilitation Journal* **2017**, *10*, 148–153, doi:10.1515/tperj-2017-0033.
11. Cece, V.; Martinent, G.; Emma, G. descas; Lentillon-Kaestner, V. The Predictive Role of Perceived Support from Principals and Professional Identity on Teachers' Motivation and Well-Being: A Longitudinal Study. *International Journal of Environmental Research and Public Health* **2022**, *19*, 6674, doi:10.3390/ijerph19116674.
12. Vaida, M. STUDY ON THE SHARE OF MEDICAL EXEMPTIONS IN THE CONTEXT OF PHYSICAL EDUCATION IN HIGHER EDUCATION. **2020**
13. Alin, B.H.; Dorina, O. SOCIOLOGICAL STUDY REGARDIND THE PUPIL'S POSTURE.
14. MERGHEŞ, P.; ŢEGHIU, A. SCREENING THE POSTURAL DEFICIENCY OF THE STUDENTS IN THE 1ST YEAR AT THE BUASVM IN TIMIŞOARA. *Editorial office: 300645 TIMIŞOARA Calea Aradului nr. 119, Phone 0256/494023/7227* 55.
15. Mocanu, G.D.; Murariu, G.; Potop, V. Optimization of Body Balance Indices According to Body Mass Index Categories during Physical Education Lessons for University Students. *Pedagogy of Physical Culture and Sports* **2022**, *26*, 233–243, doi:10.15561/26649837.2022.0403.
16. Appropriateness and Effectiveness of Adapted Aerobic Gymnastics Programmes for Students with Partial Medical Exemptions. *DPESKJ* **2021**, 72–85, doi:10.35189/dpeskj.2021.60.1.7.
17. Elena, V.; CONSTANTINESCU, M.; Sinziana, S. Prophylactic/Therapeutic Rehabilitation Modalities in Vertebral Balance Disorders in Children Aged 10-12. *Balneo Research Journal* **2020**, *11*, 516–519, doi:10.12680/balneo.2020.391.
18. Šišlova, E.; Fernāte, A. Medical Certificates for Exemption from Compulsory Study Course SPORTS at University :Problems and Solutions. *LASE Journal of Sport Science* **2017**, *Vol 8*, 17, doi:: 10.1515/ljss-2016-0045.
19. Torres, Á.; Morillo, D.; Ángulo, J.; Encalada, V.; Torresano, P.; Quiguango, M. The Professional Development of the Physical Education Staff. An Opportunity to Improve Their Performance. *Lecturas: educación física y deportes* **2017**, *21*, 1–14.
20. Ungurean, B.C. Theoretical Aspects of Intellectual Disability - Definition, Classification. *Bulletin of the Transilvania University of Braşov. Series IX: Sciences of Human Kinetics* **2021**, 247–252, doi:10.31926/but.shk.2021.14.63.1.31.
21. Khamrayeva, Z.B. *Physical Education of Students in Modern Conditions*; 2022nd ed.; European Journal of Business Startups and Open Society; Vol. Vol. 2 No. 2 (2022); ISBN ISSN: 2795-9228.
22. Mocanu, G. *Dezvoltarea calităților motrice în lecțiile de educație fizică din gimnaziu prin tratare diferențială*; Editura Fundației Universitare "Dunărea de Jos" din Galati, 2015;
23. Tai, Y. Reform of Physical Education Teaching in Colleges from the Perspective of Lifelong Physical Education: A Novel Perspective. *International Journal of Science and Engineering Applications* **2022**, 266–268, doi:10.7753/IJSEA1112.1003.
24. Hiremath, S.; Salian, P. Reform of Physical Education Teaching in College Level Based on Lifelong Physical Education. **2022**, *3*, 28–34.
25. Alsayed, A. The Effect of an Electronic Educational Program Using Multiple Intelligences on Teaching Competency of the Student Teacher at Physical Education Lesson, 2016.

26. Liang, T. On the Reform of PE Teaching in Colleges and Universities and the Cultivation of Students' PE Consciousness. *Open Access Library Journal* **2022**, *9*, 1–6, doi:10.4236/oalib.1108439.
27. Wang, L.; Yan, D.; Zhang, Y.; Wen, Y. Analysis on the Reform and Development of Physical Education Services in the Context of 5G Connected Communication. *Computational Intelligence and Neuroscience* **2022**, *2022*, e5874248, doi:10.1155/2022/5874248.
28. Liu, L.; Li, F. The Way to Deepen Reform of School Physical Education in the Background of "Healthy China." *EURASIA J Math Sci Tech Ed* **2017**, *13*, 6545–6553, doi:10.12973/ejmste/78096.
29. Хамраева, З. Pindus Journal of Culture, Literature, and ELT Managing the Education of a Young Athlete. **2022**, *3*, 140–142.
30. Dhouibi, M.-A.; Miladi, I.; Racil, G.; Hammoudi, S.; Coquart, J. The Effects of Sporting and Physical Practice on Visual and Kinesthetic Motor Imagery Vividness: A Comparative Study Between Athletic, Physically Active, and Exempted Adolescents. *Front Psychol* **2021**, *12*, 776833, doi:10.3389/fpsyg.2021.776833.
31. Moisescu, P.C.; Burlui, R.M. The Perception of Physical Education in the Romanian Educational System. *Bulletin of the Transilvania University of Braşov. Series IX: Sciences of Human Kinetics* **2019**, 113–122, doi:10.31926/but.shk.2019.12.61.2.46.
32. Das, R.; Singh, V.; Jhajharia, B.; Das, P. The Perception of Students Toward E-Learning Versus Traditional Classroom Learning. **2022**, *6*, 7198–7206.
33. Wang, L.; Yan, D.; Zhang, Y.; Wen, Y. Analysis on the Reform and Development of Physical Education Services in the Context of 5G Connected Communication. *Computational Intelligence and Neuroscience* **2022**, *2022*, e5874248, doi:10.1155/2022/5874248.
34. Gheorghe, C. The Combined Evaluation of Efficiency and Biomotor Parameters, Using Unconventional Devices to Monitor the Evolution of Handball Players in Competitions Available online: https://scholar.google.com/citations?view_op=view_citation&hl=ro&user=tUZAz1sAAAAJ&citation_for_view=tUZAz1sAAAAJ:9yKSN-GCB0IC (accessed on 5 February 2023).
35. Technologies, U. Start Your Creative Projects and Download the Unity Hub | Unity Available online: https://unity.com/download (accessed on 19 July 2022).
36. Visual Studio: IDE and Code Editor for Software Developers and Teams Available online: https://visualstudio.microsoft.com (accessed on 19 July 2022).
37. Mono (Software) - Frwiki.Wiki Available online: https://ro.frwiki.wiki/wiki/Mono_(logiciel) (accessed on 19 July 2022).
38. Adobe Photoshop oficial | Software foto și de design Available online: https://www.adobe.com/ro/products/photoshop.html (accessed on 20 July 2022).
39. Herlo, J.N. Bodybuilding Hall's Computerization Applications Fitness Worldwide and National. *Studia Universitatis Vasile Goldis Physical Education and Physical Therapy Series* **2012**, *1*.
40. Hubbard, M. Computer Simulation in Sport and Industry. *Journal of Biomechanics* **1993**, *26*, 53–61, doi:10.1016/0021-9290(93)90079-T.
41. Sykora, M.; Chung, P.W.H.; Folland, J.P.; Halkon, B.J.; Edirisinghe, E.A. Advances in Sports Informatics Research. In Proceedings of the Computational Intelligence in Information Systems; Phon-Amnuaisuk, S., Au, T.W., Eds.; Springer International Publishing: Cham, 2015; pp. 265–274.
42. Singh, V.; Bhutia, T.N.; Singh, M.K.; Bisht, P.; Singh, H.; Thomas, C.M. Comparing Mental Toughness: An Investigation on Elite Indian Standing and Seated Para-Thrower Athletes. *Journal of Public Health in Africa* **2022**, *13*, doi:10.4081/jphia.2022.2422.
43. Corbin, C.B. Conceptual Physical Education: A Course for the Future. *Journal of Sport and Health Science* **2021**, *10*, 308–322, doi:10.1016/j.jshs.2020.10.004.
44. Dreimane, S. Implementing Quiz Apps as Game-Based Learning Tools in Higher Education for the Enhancement of Learning Motivation. In *Smart Pedagogy of Game-based Learning*; Daniela, L., Ed.; Advances in Game-Based Learning; Springer International Publishing: Cham, 2021; pp. 157–166 ISBN 978-3-030-76986-4.
45. Chen, S.; Xia, Y. Research on Application of Multimedia Technology in College Physical Education. *Procedia Engineering* **2012**, *29*, 4213–4217, doi:10.1016/j.proeng.2012.01.645.
46. Nugraha, E.N.L.; Salsabila, S.; Ramadhiani, T.S. IMPLEMENTING ONLINE QUIZ APPLICATION IN EFL CLASSROOM. *International Conference on Education of Suryakancana (IConnects Proceedings)* **2021**, doi:10.35194/cp.v0i0.1365.