The Educational Review, USA, 2022, 6(12), 888-891
https://www.hillpublisher.com/journals/er/
ISSN Online: 2575-7946
ISSN Print: 2575-7938

Challenges and Development of Physical Education in Primary and Secondary Schools in the Era of 5G and Big Data

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How to cite this paper: Xin Liu. (2022). Challenges and Development of Physical Education in Primary and Secondary Schools in the Era of 5G and Big Data. *The Educational Review, USA*, 6(12), 888-891. DOI: 10.26855/er.2022.12.018

Received: November 22, 2022
Accepted: December 18, 2022
Published: January 5, 2023

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Abstract

The development of 5G network and the era of big data will bring development opportunities and challenges to the sports industry and physical education. After the COVID-19, online teaching has become a new mode of teaching, with 5G and big data providing more technical support for online teaching. Based on a full study of the characteristics of 5G and the era of big data and the business needs of physical education, this paper analyzes and demonstrates the impact of 5G networks and the era of big data on small and medium-sized physical education, focusing on the impact on physical education in terms of the current situation of application, challenges faced and development, and proposes optimizing physical education resources and equipment, optimizing out-of-classroom tracking and supervision, and optimizing the target feedback system, etc. The study also proposes ways to optimise physical education resources and equipment, optimise out-of-classroom follow-up and supervision, and optimise goal feedback systems.

Keywords

5G, big data, primary and secondary school physical education

1. Preface

On June 6, 2019, China Mobile, China Unicom, China Telecom and China Radio and Television were granted commercial 5G licenses by the Ministry of Industry and Information Technology (https://baike.baidu.com/item/5G/29780?fr= aladdin), which marks China's official entry into the 5G era. The second phase of Release-16, which will be completed in April 2020, requires a transmission speed of up to 20Gb per second, which is more than 100 times faster than the transmission speed of 4G, with a response time of less than 1 millisecond and more able to accommodate access to a large number of IoT devices and artificial intelligence. The future 5G network can change our lives and will also change our physical education activities.

In the era of big data people can quickly and efficiently tap into huge amounts of data (Li Xuanshang, 2022), freeing themselves from the constraints of subjective judgement and gaining a more comprehensive understanding of things. Big data is used to understand the demands of different parties for changes in the way physical education is taught, so that changes can be directed and targeted to meet the needs of students and teachers and improve the effectiveness of talent development.

Physical education classes are difficult at this stage due to their specialised nature and skills, trying to achieve the main purpose of students learning sports skills and exercising by changing classroom sessions and teaching methods. The integration of 5G technology and big data technology with physical education is the main direction worthy of our consideration and practice. At present, technologies such as IoT, smart wear and VR are closely related to physical

education, but the investment and research and development of software platforms for technology in the field of physical education cannot be supported compared to subjects such as language, mathematics and English.

2. 5G and big data in physical education application status

2.1 Application of MOOCs

Cloud reading, XIV whiteboard teaching and so on have been more widely used in other disciplines; now "MOOCs" have begun to be used in physical education, MOOCs is the abbreviation of Massive Open Online Courses (MOOCs) education platform (Song Bo, 2022). Students can access all the courses by simply registering and logging on to the platform, regardless of time and space, and can log on to the platform to learn according to their own preferences, as well as interact with the teacher online and review the course. At this stage, however, catechism is only widely used in universities, but rarely in primary and secondary school PE classes. Teachers can count the number of students who view the catechism videos and learn about their preferences for sports and forms of exercise, allowing for more targeted teaching. Physical education can be taught indoors on a rainy day, without the influence of time, space and teachers, and not just in a single teaching mode with PPT and pictures, but with the use of "catechism", which can be distinguished from the subject of language, mathematics and English, and is also very flexible in solving current problems.

2.2 The use of live video streaming

Live video is similar to catechism in that it is taught through video. This year was a special year, affected by the new coronavirus epidemic, and a number of places across the country adopted online teaching (Zhang Dongyu et al., 2022), with Shanghai adopting a uniform recording, similar to the catechism format. There are also a number of places that have adopted live video teaching, but live video PE classes now present a major challenge for the speed of data transmission and interaction in PE classes, with delays in information transfer between teachers and students, while PE classes are different from other subjects in that teachers need to see students' movement status and make timely assessments, and at this stage, due to limitations in the speed and responsiveness of data transmission, teachers cannot Due to the speed of data transmission and response, teachers cannot observe the status of many students in real time, and cannot make timely evaluation or improvement suggestions on students' movement.

2.3 Application of wearable smart devices

Wearable smart devices such as smart glasses, smart bracelets and smart watches are developing rapidly in the market (Yan Longyu & Tang Jie, 2021). At this stage, the smart bracelet is the one that can be widely used in physical education. Smart bracelets have functions such as sleep monitoring, exercise pedometer, heart rate detection, exercise data recording and positioning, and more accurate data can be obtained through smart bracelets. Ten pilot schools in Fengtai District, Beijing, have launched the "Internet + Campus Sports" model, which collects students' sports data and dynamically manages them through smart wearable monitoring devices, supervises the amount of one hour of physical activity per day, and issues "health check-up cards" through the collected data. "The data collected can be used to adjust the intensity and density of exercise and provide significant guidance for teaching in the PE classroom. Guangzhou True Light Secondary School provides five major functions through the smart bracelet: academic development, moral management, health and exercise, consumer borrowing and dynamic points to record students' arrival at school, exercise and other information. The teacher at Chengdu Baotong Shu Middle School had students wear sports bracelets in a basketball marching dribbling lesson to collect student movement data, monitor classroom movement and classroom load in real time, and evaluate the effectiveness of classroom teaching through big data. Through the above examples, the school has been able to initially grasp the students' exercise situation and data relatively effectively through smart devices.

3. Challenges of physical education in primary and secondary schools in the era of 5G and big data

3.1 Challenges to the authority and knowledge monopoly of physical education teachers

Since Comenius founded the modern education model, the lecture style of teaching by teachers in a fixed place 1 to many students has been in use. The physical education teacher in the physical education classroom gives a uniform lecture and demonstration, a class is scheduled to teach the same content at the same pace, and the same assessment criteria are used for students at the same stage. The development of modern education towards networking and online, the products of the 5G and big data era will have a great impact on the development of traditional primary and secondary

school physical education. In the era of 5G and big data, primary and secondary school students can quickly access physical education knowledge through the Internet, not limited to the classroom and the demonstration of physical education teachers, so the authority of teachers will be challenged. Compared to the traditional primary and secondary school physical education classroom with fixed time and space and fixed teaching content and pace, online learning not only provides students with more flexible learning time and space, but also online teaching allows them to find quality educational resources for their courses, and virtual learning communities to form online learning systems and directly participate in interactions. If you can interact with the world's leading sports stars through virtual technology in the process of learning sports skills and watch them in action, the appeal of a physical education teacher's demonstration in the classroom is unparalleled for primary and secondary school students. With the development of 5G technology, the application of big data and virtual various learning environments that can influence the way students learn will also bring huge challenges to the primary and secondary school PE classroom.

3.2 Challenges to physical education teaching methods and teaching models

With more and more complete data in the era of big data, the ability to understand and grasp the whole more comprehensively will also challenge existing teaching methods and teaching models in primary and secondary school physical education. The first presents a massive online education platform that has changed the way in which physical education skills are acquired. At the same time, as technology develops, online learning becomes a conscious behaviour and gradually becomes the main way of acquiring physical education skills, allowing students to access the best quality physical education programmes across the country and the world through the internet. The PE classroom can only play a supporting role, with the PE teacher's job being to review and correct the skills that students have learnt, as well as answering questions and other personalised tutorials. The ability of big data to create personalised teaching guidance for students based on their learning and their own characteristics will challenge the traditional PE classroom and is a trend that will change the PE teaching model in primary and secondary schools. In the past, we have also proposed teaching according to students' needs, but it is unrealistic to ask teachers to not only understand the characteristics of each student but also to follow up on each student's dynamics in every lesson. But in the era of big data, we can analyse students' learning records and practice records to find scientific learning methods and teaching modes according to students' characteristics. Of course, the current teaching methods and teaching models are not yet able to meet the online teaching conditions of the 5G and big data era, but this will become a major trend in the change of physical education in primary and secondary schools.

3.3 Challenges to students' learning autonomy

Physical education relies on big data as well as 5G technology to form a new efficient teaching model. However, the use of big data in physical education is still based on a relatively fixed data management model, due to the large individual differences in students' physical qualities. In this way, data mining is insufficient and the use of a single scenario, data authenticity can not be guaranteed without supervision for the time being, and does not help to improve the physical quality of students. The current virtual learning environment on educational websites is immature, lacks interactive subjects, is not fully developed in terms of personalisation and students are not sufficiently motivated to participate in sports practice on their own initiative. Through scientific means of testing, students can understand the intensity and density of their own exercise at each stage of the exercise, and teachers can make adjustments to the density and intensity of the exercise for students through different responses at different times, which can reasonably demonstrate the scientific nature of physical education and promote the improvement of students' physical fitness, allowing students to feel the correlation between changes in their own heart rate and the exercise load from a young age, and to understand the intensity of the exercise more clearly. In this way both student teachers are able to personalise intensity exercises for the individual and also consolidate and strengthen the position of the physical education teacher. By digitising physical education materials, exercise content etc., the data can then be monitored and analysed. By integrating big data, objective and effective decisions can be made that will help schools, teachers and students to develop quickly.

4. 5G and big data era to help the development of physical education

4.1 Optimise physical education resources and equipment

Through intelligent wearable devices and big data analysis, we can understand in advance the students' preferences for different sports, their physical fitness and daily exercise time, and arrange the venues and personnel for the courses in advance, so that students can be taught in different levels according to their conditions. The teacher can receive data from the teacher's side of the class and provide guidance and feedback to the students. Advanced technology sensing

and electronic devices can be used in the primary and secondary school PE classroom to satisfy students' curiosity and increase their interest in sport by taking control of their own exercise data. By recording exercise data and exercise habits a healthy competition can be formed to develop good exercise behaviour and teachers can monitor student exercise data to better grasp student's behavioural status and exercise trajectory. Students can understand the standard of sports performance, through the guidance of data is more intuitive than the teacher to explain, and can clearly understand their own sports status and achieve the standard, improve the efficiency of physical education.

4.2 Optimise supervision outside the classroom

Unlike other subjects, PE requires years of study and training to complete. From primary school to high school, there is little difference between the exercise areas and sports in PE classes, the difference being that the intensity and requirements vary slightly according to individual fitness. However, traditional physical education can only be taught in a way that students' performance can only be seen in physical education classes, and there is no effective monitoring of performance outside of the classroom, resulting in a failure to ensure the progress of teaching. With 5G and big data technology, teachers can remotely set and adjust learning and training goals and plans for students through their devices. This has the same function as classroom teaching but is not limited by classroom teaching time, so learning and training time is increased and the results are definitely enhanced. Students can choose their preferred way of learning and practising through big data, and teachers can use their students' preferred ways to provide personalised guidance in class, or they can digitise their movements so that students can understand their own data and that of their peers, encouraging them to train.

4.3 Optimising the target feedback system

When a behaviour receives timely positive feedback, the likelihood of the behaviour recurring increases and vice versa - this is called a 'target feedback system (Song Bo, 2022)'. If students do not receive timely positive feedback after physical activity training, they are likely to become less interested in physical activity, so it is important to optimise the feedback system for students' physical activity goals through timely data. For example, after a running test, teachers can compare students' heart rate and speed to understand the characteristics of students' exercise and amend the exercise plan in time to facilitate subsequent tests. After the students have carried out strength training, the data analysis can be used to accurately compare the strength improvement situation, so that the next time a more reasonable exercise goal can be set, which is conducive to cultivating students' confidence in exercise. With the physiological and psychological development of primary and secondary school students, gamification of students' physical exercises can enhance students' interest in participation, and timely quantitative data feedback can make students feel that their exercise behaviour is meaningful, and gradually build up confidence in the small progress.

5. Summary

The era of 5G and big data is a trend that primary and secondary school physical education must face. Be prepared to combine 5G and big data technology with the reality of primary and secondary school physical education, give personalised exercise programmes for individual student differences, and realise real-time learning and interaction through smart devices and 5G technology. Facing up to the problems that exist in the use of big data now, and with the opportunities brought by 5G, and smart wearable devices, allowing teachers to move towards refining the management of students, strengthening teachers' information technology capabilities, working towards a good transition in teaching style change, and gradually completing the development process of teaching according to ability.

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