Shahid Bahonar University of Kerman

Journal of New Studies in Sport Management

Online ISSN: 2717 - 4069

Homepage: https://jnssm.uk.ac.ir

Iranian Scientific Association of Sport Management

Quantitative Evaluation and Comparative Study of the Chinese Curriculum Standards for Physical Education and Health in Compulsory Education

Chenying Ming[1]

1. Corresponding author, Department of Physical Education and Health, University of East China Jiaotong University, Nanchang, China.

Email: mingchenying114@163.com

ARTICLE INFO

Article type:
Original article

Article history:
Received: 6 June, 2023
Received in revised form: 17 July, 2023
Accepted: 22 July, 2023
Published online: 10 November, 2023

Keywords:
Curriculum standards
PMC Index Model
Policy evaluation
Text mining

ABSTRACT

It is of great importance to compare the old and the new Chinese Curriculum Standards for Physical Education and Health in Compulsory Education to observe what has changed and what has not for the better enforcement of the updated standards. This study combines text mining and content analysis to quantitatively evaluate the texts of the 2011 and the 2022 Curriculum Standards for Physical Education and Health in Compulsory Education by constructing a Policy Model Consistency Index. The results showed that the two editions had a high degree of consistency, which is in compliance with the standard design. However, structural imbalances were noticed in the effectiveness of the 2022 Edition, which needs reconsideration of the curriculum difficulty, enhancements in the curriculum implementation, and improvements in the effectiveness of curriculum objects. Suggestions are also provided to address these issues in the hope of shedding light on related areas for front-line educators.

Introduction

The 19th National Congress of the Communist Party of China (CPC) emphasised the implementation of the fundamental task of "establishing morality and educating people", the President of the Chinese State Council put forward new requirements for cultivating new people of the times who will take up the great responsibility of national rejuvenation, and the Chinese government made a new decision to deepen the reform of compulsory education and to implement the "double-decrease" policy. Implementing these requirements means revising and improving the system of compulsory education curriculum standards and reforming the content and methods of teaching in compulsory education. On 21 April 2022, the Ministry of Education of the People's Republic of China issued the 2022 Edition of the Physical Education and Health Curriculum Standards for Compulsory Education (hereinafter referred to as "the Standards"). As a programmatic document for the development of physical education in compulsory education in the

How to Cite: Ming, C. (2023). Quantitative Evaluation and Comparative Study of the Chinese Curriculum Standards for Physical Education and Health in Compulsory Education. *Journal of New Studies in Sport Management*, 4(4), 899-909. doi: 10.22103/jnssm.2023.21646.1196

 Publisher: Shahid Bahonar University of Kerman
DOI: 10.22103/jnssm.2023.21646.1196

next ten years, the Standards point out the direction of reform, clarify the educational objectives, optimise the content and organisation of the curriculum, and become an important part of the guiding documents for the quality development of national basic education. The General Programme of Physical Education and Health Curriculum for Compulsory Education has officially entered the stage of concrete implementation, and front-line educators need to understand it better in order to teach it. Therefore, it has become imperative to analyse the links and differences between the old and new editions of the Standards.

Policy evaluation is a comprehensive analysis of policies through the use of different theories, quantitative models and technical means to both scientifically assess the policies themselves and test the actual effects of policy formulation and implementation (Sanderson, 2022). The Policy Model Consistency Index (hereinafter referred to as PMC index model) is an objective quantitative evaluation method currently used internationally to analyse policy texts. It uses the binary equilibrium variable method to construct the PMC index model and plot the PMC surface to test the internal consistency of policies and visually reflect the overall policy status based on a single policy (Estrada, 2011). These explorations have proved the objectivity and reasonableness of the model, providing new ideas and methods for quantitative assessment of policies in China. In recent years, the method has been used in the assessment of policies such as the civil-military integration policy (Wang, 2019), China's arable land protection policy (Kuang, 2020), and China's pork industry policy (Li, 2021), which are becoming more mature and provide new perspectives and horizons for the study of quantitative policy assessment. The Physical Education and Health (PEH) Curriculum Standard is a pedagogical guiding document at the national level that specifies the nature, objectives, content, and implementation of the PEH curriculum, reflecting China's education policy. Therefore, the Standards are applicable to the PMC index model.

The new edition of the Standards "new" in what? How consistent are the old and new editions of the Standards? What are the strengths and weaknesses of the new edition of the Standards? These are key questions for the successful implementation of the updated version of the Standards. At present, comparative studies of curriculum standards are mostly one-sided comparisons of content, such as breadth, depth, requirements, distribution, etc., with fewer studies from multiple perspectives. In terms of research methodology, studies at this stage can be subdivided into qualitative and quantitative studies, lacking the combination of the two. Therefore, this study adopts a combination of text mining method, content analysis method and PMC index model to conduct a multi-dimensional and systematic quantitative assessment of the overall design effects of the old and new versions of the Standards, in order to reveal the features, strengths and shortcomings of the updated version of the Standards and to put forward recommendations for implementation. This study helps frontline educators to accurately grasp the overall mission of the curriculum standards at the new developmental stage and provides targeted guidance for the design and implementation of teaching strategies.

Methodology

The Curriculum Standards for Physical Education and Health in Compulsory Education, issued by the Ministry of Education of the People's Republic of China on 28 December 2011 and 21 April 2022, were used as the data sources, respectively. The reason for selecting the two editions is that they were issued ten years apart, which enhances the timeliness and reference value; furthermore, they are similar in the content structures, which ensures comparability.

The study adopted the PMC index model combined with text mining and content analysis to conduct a quantitative evaluation of the Standards. Text mining refers to an information analysis technique that discovers and extracts valuable knowledge from unstructured text according to the patterns, relationships, etc. It can reveal facts, trends or structures. The correlation analysis function of text mining was applied to the 'variable classification and parameter identification' stage of the PMC index model, and high-frequency terms were calculated to provide a basis for identifying the primary and secondary evaluation indicators. Content analysis is a text analysis method widely used in the fields of information science, sociology and political science, which requires researchers to

identify and extract textual information from a semantic perspective. Based on text mining, this study used content analysis to interpret and summarise the Standards in order to improve the comprehensiveness and scientific validity. The PMC index model was developed by Estrada based on the Omnia Mobilis hypothesis that everything in the world is in motion and connected and that any seemingly unrelated variables should be forgotten and weighted(Estrada, 2017). The model uses text mining to obtain the raw data, largely avoiding subjectivity and improving accuracy. In addition, all potentially relevant variables are taken into account in the choice of variables. Thus, one-sided results are avoided. In conclusion, the PMC index model differs from other policy evaluation models in that it uses binary to balance all variables, eliminating restrictions on the number and weighting of variables and allowing the analysis of internal consistency and pros and cons of all dimensions.

According to the research questions and objectives, the research process is as follows. (1) Construct the PMC index model. (2) Calculate the PMC index, map the PMC surface and analyse the results. (3) Draw conclusions and suggestions.

The study used ROST CM6 software to pre-process the Standards, which provided a basis for identifying the primary and secondary variables. The Standards were first sub-worded, then after filtering out terms that were not pertinent, high-frequency terms were extracted and ranked, and finally a social network map was formed of the high-frequency terms, which revealed the characteristics of the Standards (see Figure 1, 2).

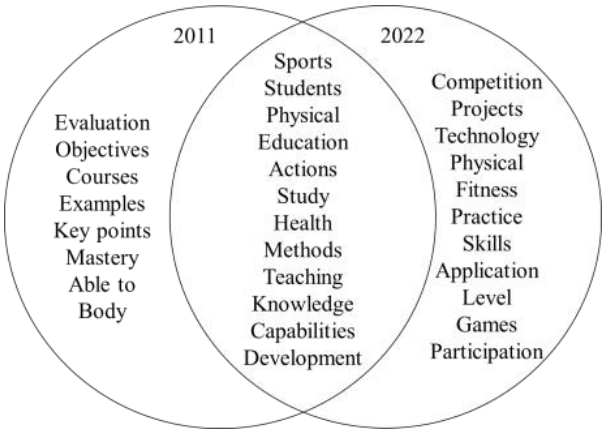

Figure 1. Top 20 high-frequency terms in the Standards

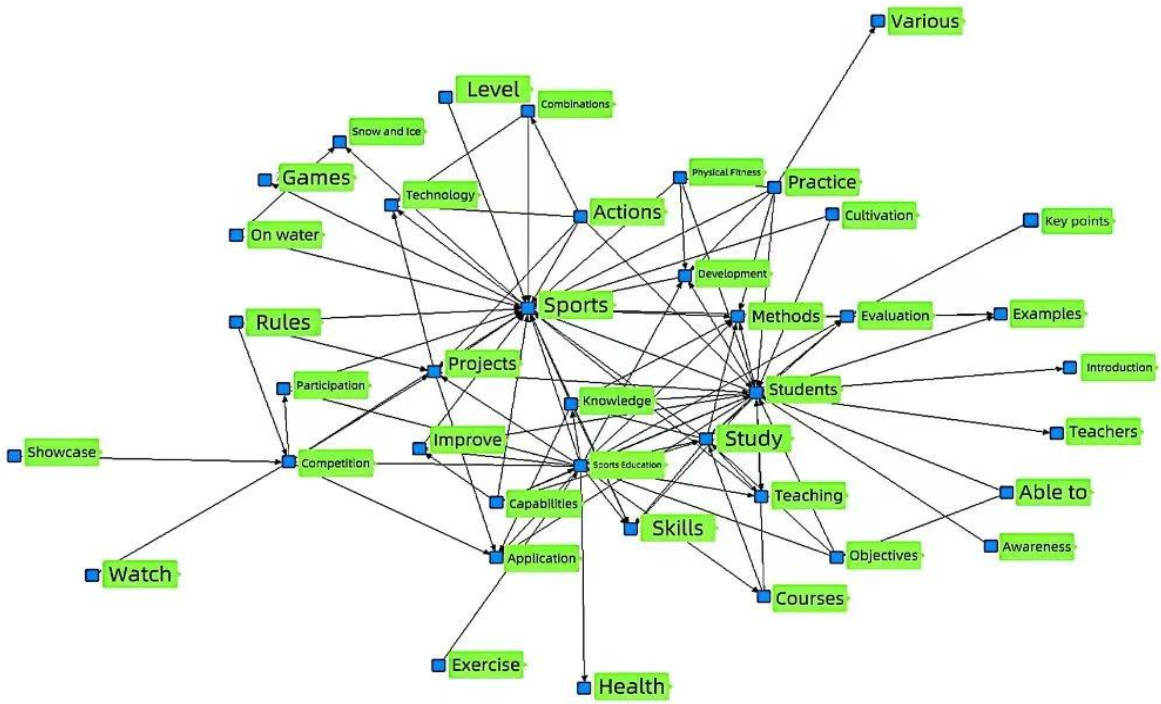

Figure 2. Social network map of the high-frequency words in the Standard

On the basis of the top 20 high-frequency terms in the Standards, this study referred to the policy evaluation indicators defined by Estrada and other scholars and existing theories of curriculum standards. The approach and theories were combined with the characteristics of the Standards. As a result, 10 primary and 37 secondary variables were identified after a consensus cross-blind selection by the three members of our research team. The primary variables were Curriculum Nature X1, Curriculum Orientation X2, Core Literacy X3, Curriculum Difficulty X4, Curriculum Content X5, Curriculum Implementation X6, Policy Object X7, Policy Perspective X8, Policy Effectiveness X9, and Paper Citation X10. The above variables followed the binary rule, with a value of 1 when the textual content of the Standards conformed to the definition of the corresponding variable, and 0 otherwise. As there was no secondary variable in the Paper Citation X10, this item was only considered as a primary variable with a value of 1 for 'yes' and 0 for "no". In addition, in order to further improve the credibility of the assignment of the variables, the research team also used the Delphi method to obtain the judgement of the relevant experts through anonymous means, so that the variables could be assigned more scientifically and rationally (see Table 1).

Table 1. Settings of quantitative evaluation variables in the Standards

Primary Variables	Secondary Variables	Source or Basis
X1 Curriculum Nature	X1:1 Technical Course; X1:2 Theoretical Course; X1:3 Practical Course.	High-frequency terms and their social network mapping in text-based mining
X2 Curriculum Orientation	X2:1 Academic Rational Orientation; X2:2 Cognitive Process Orientation; X2:3 Humanist Orientation; X2:4 Social Renewal Orientation; X2:5 Technology Development Orientation.	High-frequency terms and their social network mapping in text-based mining
X3 Core Literacy	X3:1 Cultural Foundations; X3:2 Autonomous Development; X3:3 Social Participation.	High-frequency terms and their social network mapping in text-based mining
X4 Curriculum Difficulty	X4:1 Curriculum Breadth; X4:2 Curriculum Depth; X4:3 Curriculum Time.	High-frequency terms and their social network mapping in text-based mining
X5 Curriculum Content	X5:1 Games and Sports; X5:2 Concepts about Movement; X5:3 Dance, Rhythmic Movement; X5:4 Outdoor Education/Recreation Activities and Lifestyle Activities; X5:5 Food and Nutrition; X5:6 Relationships Education; X5:7 Safety; X5:8 Wellbeing (Physical fitness, Mental health and Managing Stress).	Based on the OECD 'Learning Framework 2030'(OECD, 2018)
X6 Curriculum Implementation	X6:1 Environmental Instruments; X6:2 Supply Instruments; X6:3 Demand Instruments.	A classification method for policy instruments based on Rothwell and Zegveld(Rothwell, 1985)
X7 Policy Object	X7:1 Students; X7:2 Teachers; X7:3 Referees; X7:4 Teams; X7:5 Schools; X7:6 Third Parties.	High-frequency terms and their social network mapping in text-based mining
X8 Policy Perspective	X8:1 Input; X8:2 Process; X8:3 Output.	High-frequency terms and their social network mapping in text-based mining
X9 Policy Effectiveness	X9:1 Regulatory Type; X9:2 Incentive Type; X9:3 Social Type.	High-frequency terms and their social network mapping in text-based mining
X10 Paper Citation		Modified from M.A. Ruiz Estrada(Estrada, 2011)

In order to facilitate data storage, calculation and analysis, multiple input-output tables need to be constructed on the basis of variable classification and parameter identification. In addition, in order to minimise subjective errors in policy evaluation, in the process of scoring and assigning values to policies based on multi-input-output tables, the corresponding score will only be increased if the content of the indicator is clearly described in the policy text and occupies a certain space; and for content that cannot be determined, the decision on whether to add points will be made after discussion with experts, a practice that can increase the reliability of the evaluation results to a certain extent. The following multi-input-output table shows the values assigned to the secondary variables for each policy (see Table 2).

Table 2. Application of binary system in the multi-input-output table

X1	**X1:1**	**X1:2**	**X1:3**	**X2**	**X2:1**	**X2:2**	**X2:3**	**X2:4**	**X2:5**			
2011	1	1	1		1	1	1	1	0			
2022	1	1	1		1	1	1	1	1			
X3	X3:1	X3:2	X3:3	**X4**	X4:1	X4:2	X4:3					
2011	1	1	1		1	1	0					
2022	1	1	1		1	0	1					
X5	X5:1	X5:2	X5:3	X5:4	X5:5	X5:6	X5:7	X5:8	**X6**	X6:1	X6:2	**X6:3**
2011	1	1	1	1	1	1	1	1		1	1	**0**
2022	1	1	1	1	1	1	1	1		1	1	**0**
X7	X7:1	X7:2	X7:3	X7:4	X7:5	X7:6	**X8**	X8:1	X8:2	X8:3		
2011	1	1	0	1	1	0		1	1	0		
2022	1	1	1	1	1	0		1	1	1		
X9	X9:1	X9:2	X9:3	**X10**	X10							
2011	1	0	0		1							
2022	1	1	0		1							

The size of the PMC index can reflect the overall effect of the policy. According to Estrada's method, after determining the quantitative evaluation variables, text mining is used to quantitatively evaluate the relevant variables, and the specific calculation is divided into four steps.

(1) The two-level variables are placed in the multi-input-output table.

(2) Assign values to the two-level variables based on equations (1) and (2) in accordance with the text mining.

(3) Calculate the values of the primary variables according to equation (3).

(4) The PMC index is calculated according to equation (4), and then the Standard PMC index is scored according to Estrada's evaluation criteria (score 9-10, perfect; score 7-8.99, good; score 5-6.99, acceptable; score 0-4.99, low).

$$X \sim N[0,1] \quad (1)$$

$$X = \{XR: [0 \sim 1]\} \quad (2)$$

$$X_t = \left(\sum_{j=1}^{n} \frac{X_{tj}}{T(X_{tj})}\right) \; t = 1,2,3 \ldots \quad (3)$$

Where (3) t = primary variable; j = secondary variable

$$PMC = \left[X1\left(\sum_{i=1}^{3}\frac{X1i}{3}\right) + X2\left(\sum_{j=1}^{5}\frac{X2j}{5}\right) + X3\left(\sum_{k=1}^{3}\frac{X3k}{3}\right) + X4\left(\sum_{l=1}^{3}\frac{X4l}{3}\right) + X5\left(\sum_{m=1}^{8}\frac{X5m}{8}\right) + X6\left(\sum_{n=1}^{3}\frac{X6n}{3}\right) + X7\left(\sum_{o=1}^{6}\frac{X7o}{6}\right) + X8\left(\sum_{p=1}^{3}\frac{X8p}{3}\right) + X9\left(\sum_{q=1}^{3}\frac{X9q}{3}\right) + X10\right] \quad (4)$$

Table 3. Application of binary system in the multi-input-output table

The PMC index model score	**0~4.99**	**5~6.99**	**7~8.99**	**9~10**
Consistency	Low	Acceptable	Good	**Perfect**

The PMC surface map can present the strengths and weaknesses of the Standards visually and directly, facilitating further analysis and assessment. Based on the results of the PMC index, this study constructed a PMC surface map in accordance with the 3×3 matrices of equation (5).

$$\text{PMC} - \text{Surface} = \begin{bmatrix} X1 & X2 & X3 \\ X4 & X5 & X6 \\ X7 & X8 & X9 \end{bmatrix} \quad (5)$$

Results

According to the PMC index model and the PMC surface map of the Standards, it is notable that the both editions have a PMC index score of 7 or above, and the PMC surface map is located in the upper part of the scale with a sound consistency. The figures indicate that the Standards are of high quality, provideing directional guidance for physical education and playing a programmatic and exemplary role.

The study analysed the strengths and weaknesses of the Standards by comparing the differences between the scores on the primary variables, the mean, and the "perfect" Standard (see Table 4, 5 and Figure 3, 4, 5).

Table 4. The PMC Index evaluation

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	PMC Index	Consistency
2011	1.00	0.80	1.00	0.67	0.88	0.67	0.67	0.67	0.33	1.00	7.69	Good
2022	1.00	1.00	1.00	0.67	1.00	0.67	0.83	1.00	0.67	1.00	8.84	Good
Mean value	1.00	0.90	1.00	0.67	0.94	0.67	0.75	0.84	0.5	1.00	8.26	-

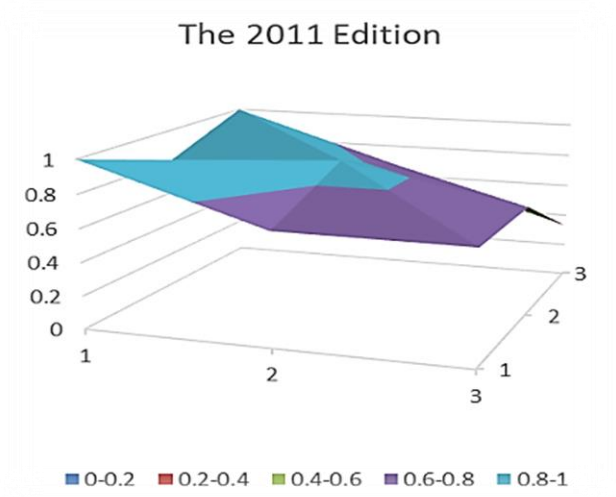

Figure 3. The 2011 Edition Standards PMC surface map

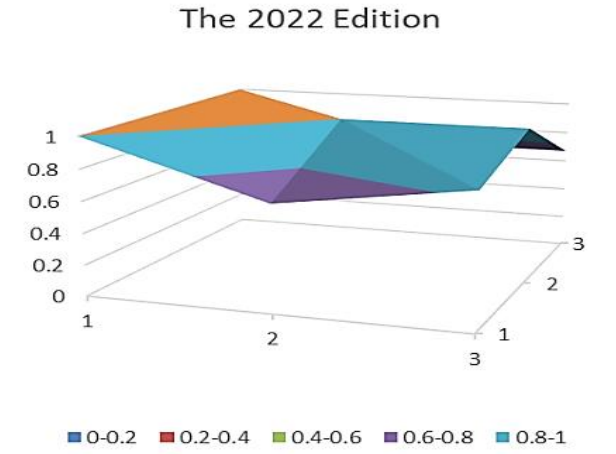

Figure 4. The 2022 Edition Standards PMC surface map

Table 5. The Concavity Index of the Primary Variables of the Standards

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	Concavity Index
2011	0.00	0.20	0.00	0.33	0.12	0.33	0.33	0.33	0.67	0.00	**2.31**
2022	0.00	0.00	0.00	0.33	0.00	0.33	0.17	0.00	0.33	0.00	**1.16**
Mean value	0.00	0.10	0.00	0.33	0.06	0.33	0.25	0.16	0.5	0.00	**1.73**

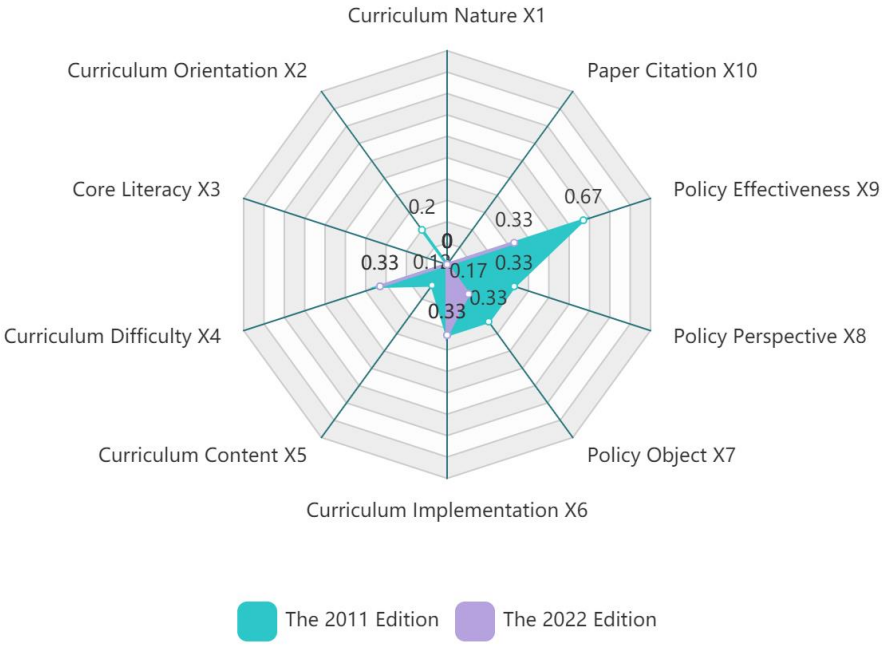

Figure 5. Radar plot of the depression index of the main variables of the Standard

Discussion and Conclusion

The comparison of the primary variable scores of the Standards with the mean shows:

(1) Both editions scored equal to the mean in Curriculum Nature X1, Core Literacy X3, Curriculum Difficulty X4, Curriculum Implementation X6 and Text Citation X10 with scores of 1, 1, 0.67, 0.67 and 1 respectively. The numbers indicate that the two standards are concentrated in a relatively central position in these five aspects, achieving a moderate or comparatively high level of consistency.

(2) The 2011 Edition scored below the mean in Curriculum Orientation X2, Curriculum Content X5, Policy Object X7, Policy Perspective X8 and Policy Effectiveness X9, while the 2022 Edition scored above the mean in these areas, indicating that the 2022 Edition has optimised the 2011 Edition. Furthermore, the latest edition focuses on "how to achieve all-around development; how to develop a child's comprehensive competence; and how to motivate people involved in physical education".

The Concavity Index, which measures the difference between the Standards and the "perfect" Standard (with full values at all levels), is negatively correlated with the PMC Index. The concavity of the variables at each level of the Standards from the longitudinal view. The following analysis focuses on the 2022 Edition of the Standards Concavity Index in the order from highest to lowest.

(1) In terms of Policy Effectiveness X9, the Standards has the largest concavity with a mean value of 0.5. First, the study found that the 2011 Edition is a normative measure, with expressions such as "abide by the rules of physical education and exercise self-regulation in physical activities" and "improve the standardization of physical activity". According to Zhenming Mao, during the syllabus creation process, certain subjects had the absolute authority empowered by their scientific nature so that they could mandate the pedagogical content(M. Zhenming, & Duoduo, Y., 2018). These were the requirements of the examination and the internal logic of the subject. But it was needed during the period when the syllabus turned to curriculum standards, because it was an advocacy and was inherited in the 2011 edition. Secondly, in the 2022 Edition, a balance between

prescriptiveness and flexibility is struck, and more incentives have been promoted. The 2022 Edition focuses not only on setting standards and establishing rules, but also on specifying a combination of quantitative and qualitative academic quality standards, which has not been seen in the previous edition. The use of academic quality standards to guide 'teaching' and 'learning' is conducive to encouraging students to participate in physical activities. Thirdly, there are no explicit social measures in either edition, which suggests a low level of mandatory. According to the social learning theory proposed by American psychologist Albert Bandura(Bandura, 1977), social learning aims to break the spatial limits of learning and move beyond the curriculum to society. Students learn about sport in real life, take responsibility for the development of sport in society as their own and truly understand the importance of sport in the development of self, others and society. This highly autonomous social behaviour is not presented in the Standards.

(2) In terms of Curriculum Difficulty X4, the mean value of the concavity index for the Standards is 0.33. To be specific, the proportion of class time in both editions of the Standards is 10-11%, with no increase or decrease. As early as 2001, PE was already the third main subject, but the time for PE class was squeezed in schools because of the examination-oriented teaching. Therefore, PE has been out of the mainstream of education. As for the curriculum depth, the greater one's expertise in a sporting skill area, the more complex the structure of the knowledge network. Nonetheless, considerable expertise may in turn restrict technical reorganisation and reduce the ability to innovate. The curriculum breadth under the topic refers to the richness of one's mastery of different sports and the degree of diversity of knowledge, skills and experience. The increased breadth of the curriculum provides access to a wider range of sports. It helps to recombine knowledge and skills across the curriculum, which may lead to 'cognitive overload', where the diversity of recombination possibilities may make technical mastery impossible, leading to more extreme results, either very novel or very unsuccessful. The 2022 Edition includes, in addition to traditional sports, new ones such as rock climbing, skateboarding and synchronized skipping. Has the breadth of the curriculum been expanded by the inclusion of sports? And has this weakened the depth of the curriculum? How should the depth and breadth of the curriculum be handled and balanced? These are all questions that deserve some thoughts.

(3) Regarding Curriculum Implementation X6, the mean value of the concavity index for the Standards is 0.33. Both editions have dealt with Supply and Environment instruments, which show that teachers have been aware of how to 'teach' and provide the conditions for pupils to 'learn'. However, on the other hand, they lack the required tools. Although both editions have briefly mentioned the importance of "stimulating students' interest in sport", they rarely take into account the differences in students' independent choices, which has led to the persistent problem of students "liking PE but not enjoying PE lessons". The reason for this, according to Liu Ji, is that the monotonous teaching style, dogmatic teaching routines and lengthy lectures make it difficult for the curriculum to fulfil its nurturing function(Liu, 2018). Zhenming Mao argues that when competitive sport becomes physical education, the joy of sport begins to fade away, and the result of learning sport means knowing a little of everything without really learning anything (M. Zhenming, Yuanyuan, Z., & Ling, Y., 2019). The subjectivity of students was ignored, and the students' interest in sport has not been aroused by the curriculum, which threatened the vitality of PE as China's centuries-old national curriculum and even its value in school education. Hence, a question is raised: where has the "fun" of PE gone? At the 2018 National Education Conference, Chinese President stressed the importance of 'helping students enjoy physical exercise, strengthen their physique, develop their personality and strengthen their willpower.' The importance of 'enjoying fun' was evident as the President put it at the top of his list. However, when PE is implemented, students' autonomy in terms of choice of sport, time, rules and partners is severely restricted. These restrictions are not explicitly lifted in the Standards, thus creating a concavity in Curriculum Implementation X6.

(4) When it comes to Curriculum Object X7, the mean value of the concavity index for the Standards is 0.25. The results demonstrate that the word "team" appears less frequently in the 2011 Edition than in the 2022 Edition, while the word 'third party' does not appear in either edition. On the one hand, the emphasis on "team culture" in small groups is consistent with the development of students' sports skills. In fact, the disadvantages of 'traditional PE classes' lie in unclear goals, too

many players and lack of time for joint action, whereas the advantages of 'teams' are the permanence and intimacy between players and coaches, the determination and motivation of the players, the explicit division of work, and sense of collective belonging. The 2022 Edition is a major step to rectify 'the failure of students to engage in the appropriate and civilised exercise of lifelong sport after 12 years of physical education'. On the other hand, both editions refer extensively to safety issues, but do not mention third-party intervention in any major accidents at home and school. This is mainly because the causes of accidents are varied, such as students' disciplinary violations, school equipment malfunctionings, teachers' unprofessionalism, etc. Considering the incidental nature, accidents need to be analysed on a problem-specific basis. In addition, there are no clear legal provisions for handling sports-related injuries in schools in China. The handling of these injuries is more based on the general principles of the General Principles of the Civil Law of the People's Republic of China and the Tort Liability Law of the People's Republic of China, the core of which is the principle of the fault and the liability of schools for sports-related injuries to school students, which makes schools afraid and reluctant to conduct in-class and out-of-class competitions. In reality, families and schools in conflict are at odds with each other and have no solution to the problem, requiring the use of third-party mechanisms. In the face of the shortcomings of school sport safety, third parties have stepped in, and the Standards should be brought up to date so that school sport safety is no longer an obstacle to the development of school sport.

The mean values of the concavity index of the Standards for Curriculum Nature X1, Curriculum Orientation X2, Core Literacy X3, Curriculum Content X5 and Policy Perspective X8 are 0.00, 0.1, 0.00, 0.06 and 0.16, respectively, indicating that they are more consistent and dominant in the abovementioned areas.

The concavity of the two versions of the Standards from the horizontal view. The concavity indices for the two editions range between 0.12 and 0.67. Specifically, the 2011 Edition is between 0.12 and 0.67 and falls short of achieving "perfect" Standard in seven areas: Curriculum Orientation X2, Curriculum Difficulty X4, Curriculum Content X5, Curriculum Implementation X6, Curriculum Object X7, Policy Perspective X8 and Policy Effectiveness X9. By contrast, the 2022 Edition is between 0.17 and 0.33 and has been promoted in three areas: Curriculum Orientation X2, Curriculum Content X5 and Policy Perspective X8, but it is still far from the 'perfect' Standard in four areas: Curriculum Difficulty X4, Curriculum Implementation X6, Curriculum Objects X7 and Policy Effectiveness X9. There are still gaps in these four areas and therefore improvements need to be made.

There is a high degree of consistency in the Standards. Based on the PMC index, PMC surface and concavity index, it is found that the two editions have a high degree of consistency in five aspects: Curriculum Nature X1, Core Literacy X3, Curriculum Difficulty X4, Curriculum Implementation X6, and Paper Citation X10.

The design of the Standards is generally reasonable. Both editions of the PMC Index are ranked as Good, with the 2022 Edition being closer to the "perfect" Standard. The 2022 Edition has been optimised from the 2011 Edition in three aspects: Curriculum Orientation X2, Curriculum Content X5 and Policy Perspective X8. The 2022 Edition focuses on 'how to achieve all-around development; how to develop a child's comprehensive competence; and how to motivate people involved in physical education'. In addition, the 2022 Edition achieves "perfect" Standard in six respects: Curriculum Nature X1, Curriculum Orientation X2, Core Literacy X3, Curriculum Content X5, Policy Perspective X8 and Paper Citation X10, with clear advantages.

There is still room for improvement in the Standards. The quantitative evaluation of the Standards shows that the design has the following shortcomings. (1) There is a structural imbalance in the policy effectiveness. The 2011 Edition is highly mandatory and normative. While the 2022 Edition balances normativity with flexibility, promoting incentives, such as "academic quality standards". Nevertheless, there is little mention of the social measures of student learning in either edition, leading to a structural imbalance in the policy effectiveness. (2) The curriculum difficulties need to be reconsidered. There is no change in the class span between the two editions. However, the 2022 Edition expands the breadth of the curriculum difficulty without explicitly stating the

depth. How to balance the contradiction between the depth and breadth of the curriculum content and the difficulty of the curriculum is to be reconsidered. (3) The curriculum implementation needs to be improved. Both editions lack demand instruments, and little consideration is given to the variability of students' freedom of choice. As a result, it is difficult for students to enjoy the well-designed exercise. Students' restrictions on sports, time, rules and partners are not clearly lifted in the Standards. (4) The effectiveness of the object in the curriculum is challenging to achieve. Teamwork is particularly emphasised in the 2022 Edition, but more effort should be paid to encouraging students to involve in lifelong exercise. Apart from that, both editions fail to mention terms referring to ″third party″. Facing the weak links, schools are still unable to avail themselves of the offers provided by a third party in emergency responses.

In response to the characteristics, strengths and weaknesses of the Standards, the following implementation recommendations are put forwards.

Firstly, we should keep the mission and core values at the forefront, which is fulfilling the fundamental task of "Morality Education" and fostering new generations to take up the responsibility of national rejuvenation. The physical education and health curriculum not only teaches students professional knowledge and skills, but also improves their physical fitness. At the same time, students can develop the spirit of patriotism, collectivism and socialism, improving their overall quality and accumulating social experience. In this vein, the nurturing function of the curriculum can be realised.

Secondly, we are focusing on the implementation of the Health China 2030 Program and working to develop students' proficiency in at least one sporting skill. On the one hand, schools need to provide variable, adequate and accessible physical courses and health curriculums, which are the prerequisites for mastering motor skills. Schools should ensure that students have one hour of physical activity every day both in and out of school and improve the quality of teaching in the 1,260 lessons. On the other hand, schools should balance the contradiction between the depth and breadth of the curriculum. Furthermore, as curriculum designers, physical education teachers should get rid of the misconception that 'physical education must include a great number of sports for fully development'; they should be bold and innovative. This can be inspired by Liu Ji's "Chinese Physical Education and Health Curriculum Model"(Liu, 2015) and Zhenming Mao's "The Optional Sports System" (M. Zhenming, & Duoduo, Y., 2018). In terms of textbook editing, the relationship between depth and breadth should be co-ordinated, and the difficulty of textbooks should be carefully thought over.

Thirdly, we are committed to protecting children's innocence and implementing the policy of "having fun, improving physical fitness, developing personality, and strengthening willpower". In this way, students will enjoy not only physical education but also taking classes. Schools need to bring the fun back into the PE classroom by normalising sports competitions so that all students can have the chance and experience of succeeding. Furthermore, schools should make sport skills core so that students can enjoy self-improvement during their education. Finally, teaching methods should be more flexible, ensuring all students can enjoy sports.

Last but not least, we should work together to implement 'lifelong physical education' and encourage students to persist in physical exercise. On the one hand, schools should adhere to the principle of 'health first' by organizing sports activities both inside and outside the classroom and promoting the shift from "class culture oriented" to "team culture oriented". On the other hand, the education of some sports should not be stifled by the fear of accidents. In order to avoid the negative effects of sporting risks, schools should establish a long-term mechanism for preventing and dealing with accidents to ease the concerns. President Xi Jinping stressed that all parties have a responsibility to provide good education. The "Trinity" system of collaborative education between school, family and society should be firmly established as an important guarantee for students to stay physically active.

Acknowledgment

Thanks to all researchers for contributing to this research.

References

Bandura, A. (1977). *Social learning theory*. People's University of China Press.

Estrada, M. A. R. (2011). Policy modeling: Definition, classification and evaluation. *Journal of Policy Modeling, 33*(04), 523–536. doi:10.1016/j.jpolmod.2011.02.003

Estrada, M. A. R. (2017). An alternative graphical modeling for economics: Econographicology. *Quality & Quantity, 51*, 2115–2139. doi:10.1007/s11135-015-0280-3

Kuang, B., Han, J., Lu, X., Zhang, X., & Fan, X. (2020). Quantitative evaluation of China's cultivated land protection policies based on the PMC-Index model. *Land Use Policy, 99*, 105062. doi:10.1016/j.landusepol.2020.105062

Li, Y., He, R., Liu, J., Li, C., & Xiong, J. . (2021). Quantitative evaluation of China's pork industry policy: A PMC index model approach. *Agriculture, 11*(02), 86. doi:10.3390/agriculture11020086

Liu, J. (2015). Reflection and Construction of Physical Education and Health Curriculum Model in China. *Journal of Beijing Sport University, 38*(09), 72-80.

Liu, J. (2018). Interpretation of National Physical Education and Health Curriculum Standards (2017 Edition) of High Schools in China. *China Sport Science, 38*(02), 3-20.

OECD. (2018). Education 2030 Curriculum Content Mapping: An Analysis of the Netherlands Curriculum Proposal. Retrieved from http://www.oecd.org/education/2030-project/contact/E2030_CCM_analysis_NLD_curriculum_proposal.pdf

Rothwell, R. Z., W. (1985). *Reindustrialization and Technology*. London: Longman Group Limited.

Sanderson, I. (2022). Evaluation,Policy Learning and Evidence-Based Policy Making. *Public Administration, 80*(01), 1-22. doi:10.1111/1467-9299.00292

Wang, J., Yang, Q., & Zhang, Y. (2019). Quantitative evaluation of civil-military integration policy based on PMC-AE index model. *Journal of Intelligence, 38*(04), 66–73. doi:10.3969/j.issn.1002-1965.2019.04.011

Zhenming, M., & Duoduo, Y. (2018). "Health China 2030 Program" and School P.E.Reform Strategies(1):For the Juvenile's Commanding One or More than One Motor Skill. *Journal of Wuhan Institute of Physical Education, 52*(02), 5-10.

Zhenming, M., Yuanyuan, Z., & Ling, Y. (2019). On the Loss and Return of Sports Fun in Physical Education Class. *Journal of Chengdu Sport University, 45*(02), 33-37+31-32+32.