

# The Implementation Path of Digital Empowerment for the Integration of In-Class and Out-of-Class Physical Education Teaching in Colleges and Universities under the Physical Fitness Enhancement Program

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## Abstract

Against the backdrop of the in-depth advancement of the Physical Fitness Enhancement Program, the integration of in-class and out-of-class physical education teaching in colleges and universities has become a key initiative to improve students' physical health and fulfill the fundamental task of moral education. The rapid development of digital technology has provided new technical support for breaking down barriers between in-class and out-of-class physical education teaching, integrating teaching resources, and optimizing teaching models. Adopting a combination of literature review, investigation, and systematic analysis methods, this study aligns with the policy requirements of the Physical Fitness Enhancement Program and the current status of digital development in college physical education teaching. It identifies the practical challenges faced by digital empowerment in the integration of in-class and out-of-class physical education teaching in colleges and universities, and constructs a four-dimensional implementation path: "policy guidance, technical support, teaching integration, and guarantee protection". This research provides theoretical references and practical guidance for colleges and universities to promote the integration of in-class and out-of-class physical education teaching through digital means, and further assists in the effective implementation of the Physical Fitness Enhancement Program.

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## Keywords

Physical Fitness Enhancement Program, College Physical Education Teaching, Digital Empowerment, Integration of In-class and Out-of-Class, Implementation Path

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## 1. Introduction

With the successive issuance of policies such as the “Healthy China 2030 Plan” and the “Opinions on Deepening the Integration of Sports and Education to Promote the Healthy Development of Adolescents”, the Physical Fitness Enhancement Program, as a core measure to promote the improvement of adolescents’ physical health, explicitly requires colleges and universities to strengthen the reform of physical education teaching, break the boundaries between classroom teaching and extracurricular physical exercise, and establish an integrated in-class and out-of-class physical education teaching system. Currently, college physical education in China still faces problems such as the “disconnection between classroom and extracurricular teaching, the separation of teaching and fitness, and the mismatch between evaluation and actual effects”. The phenomena of insufficient student participation in extracurricular physical exercise and slow improvement in physical health have not been fundamentally addressed, making it difficult to fully meet the implementation requirements of the Physical Fitness Enhancement Program (The CPC Central Committee and the State Council et al., 2016; Ministry of Education et al., 2025). The iterative upgrading of digital technology has injected new vitality into the reform of college physical education. The in-depth integration of big data, artificial intelligence, somatosensory interaction, online teaching platforms, and other technologies with physical education can effectively integrate in-class and out-of-class physical education resources, optimize teaching processes, accurately capture students’ sports data, and stimulate students’ enthusiasm for exercise. It has thus become an important means to address the bottlenecks in the development of integrated in-class and out-of-class physical education teaching in colleges and universities. In this context, exploring the implementation path of digital empowerment for the integration of in-class and out-of-class physical education teaching in colleges and universities under the Physical Fitness Enhancement Program is not only an inevitable requirement for implementing national physical education policies but also a practical need for promoting the high-quality development of college physical education and improving students’ physical health. To clarify the research boundaries and ensure the rigor of the study, the core concept of “digital empowerment” is operationally defined below, and its differences from related concepts are distinguished.

As used in this study, “digital empowerment” specifically refers to the targeted support capacity provided by colleges and universities for the reform of integrated in-class and out-of-class physical education teaching through digital technologies

under the framework of the Physical Fitness Enhancement Program. Its core capabilities include data collection, processing and analysis, teaching feedback and guidance, resource integration and sharing, and evaluation optimization. These capabilities enable the capture of students' in-class and out-of-class sports and learning data, the accurate alignment of teaching needs, the breakdown of teaching barriers, and the improvement of evaluation systems. This study does not include complex intelligent decision-making, in-depth interdisciplinary integration (e.g., the in-depth cross-border application of sports, medicine, and artificial intelligence), or large-scale digital governance capabilities, focusing instead on the core needs of physical education teaching. Compared with digitalization, which emphasizes the digital transformation of information, digital empowerment focuses on empowering teaching reform through technology. In contrast to blended teaching—a teaching model that combines online and offline approaches—digital empowerment serves as a means and capability to support the implementation of such models, forming a supportive and supported relationship between the two.

## 2. Research Methods

This study adopts a combination of multiple research methods to ensure scientific rigor: first, the literature review method. Through authoritative databases such as CNKI and Wanfang, relevant literature on the Physical Fitness Enhancement Program, college physical education teaching, digital empowerment, and the integration of in-class and out-of-class teaching was retrieved. Relevant theoretical achievements and research status were systematically summarized to clarify the research context and identify research gaps, laying a solid theoretical foundation for this study. Second, the investigation method. This study mainly employed semi-structured interviews for data collection, with college physical education teachers, physical education teaching managers, and college students as the core interviewees. A targeted interview outline was designed to cover the current status of integrated in-class and out-of-class physical education teaching, the application of digital tools, practical challenges, and development needs. Through purposive sampling, 32 respondents from multiple colleges and universities were selected for one-on-one interviews (including 12 physical education teachers, 8 physical education teaching managers, and 12 college students). Prior to each interview, respondents were clearly informed of the research purpose, interview process, and data usage rules. With the written or oral consent of the respondents, the entire interview process was recorded, and text transcription was completed promptly after each interview to form a comprehensive set of original interview data. Subsequently, thematic analysis was used to sort and code the interview data, extracting core viewpoints and key issues around the dimensions of policy implementation, technology adaptation, teaching connection, and teacher capacity. Based on this analysis, practical challenges were summarized to provide a practical basis for constructing the implementation path, ensuring that the research conclusions are practically relevant. Third, the systematic analysis method. Based on the core research

focus, this study systematically analyzed the core elements, internal connections, and operational logic of digital empowerment for the integration of in-class and out-of-class physical education teaching in colleges and universities from four dimensions: policy, technology, teaching, and guarantee. Combined with previous research results, a scientific, reasonable, and operable digital empowerment implementation path was constructed to ensure the systematicness and completeness of the research.

### **3. Current Situation of Digital Empowerment for the Integration of In-Class and Out-of-Class Physical Education Teaching in Colleges and Universities under the Physical Fitness Enhancement Program**

Survey results indicate that with the in-depth advancement of the Physical Fitness Enhancement Program and the rapid development of digital technology, Chinese colleges and universities have gradually attached greater importance to the digital construction of physical education teaching and the reform of in-class and out-of-class integration, achieving certain developmental outcomes. First, digital teaching resources have been gradually enriched. Most colleges and universities have introduced online teaching platforms (e.g., Chaoxing Xuexitong, Yuketang) and sports-specific apps (e.g., Sports World Campus, Lejian Sports), while some have equipped themselves with sports data collection devices (e.g., heart rate monitors, sports bracelets), providing basic conditions for digital empowerment of in-class and out-of-class integration. Second, teaching models have been gradually innovated. Some colleges and universities have adopted an integrated teaching model of “online preview + offline practice + online feedback”, promoting the extension of classroom teaching content to extracurricular settings and guiding students to complete independent exercise tasks in their spare time. Third, policy support has been gradually strengthened. Education departments at all levels have successively issued relevant policies to encourage colleges and universities to promote the digital reform of physical education teaching and the construction of in-class and out-of-class integration, providing policy guidance for digital empowerment (Liu et al., 2026). Fourth, the guarantee system has been gradually improved. Some colleges and universities have increased investment in digital physical education teaching, assigned full-time technical personnel responsible for platform operation, maintenance, and equipment debugging, and conducted training on digital teaching capabilities for physical education teachers, improving the integrated in-class and out-of-class teaching evaluation mechanism and providing personnel, financial, and institutional guarantees for the continuous advancement of digital empowerment. Fifth, students’ enthusiasm for participation has gradually increased. The interactivity and convenience of digital tools have effectively stimulated students’ interest in extracurricular physical exercise, leading to a certain improvement in the frequency and duration of extracurricular physical exercise among students in some colleges and universi-

ties.

## **4. Practical Difficulties of Digital Empowerment for the Integration of In-Class and Out-of-Class Physical Education Teaching in Colleges and Universities under the Physical Fitness Enhancement Program**

### **4.1. Inadequate Policy Implementation and Lack of Overall Planning**

Although the state has issued relevant policies such as the Physical Fitness Enhancement Program, which explicitly require colleges and universities to promote the digital reform of physical education teaching and the construction of in-class and out-of-class integration, some colleges and universities have not fully understood these policies and lack targeted implementation measures. First, most colleges and universities have not incorporated the digital empowerment of in-class and out-of-class integration into the overall plan for physical education teaching reform, lacking clear development goals and implementation guidelines. This has led to the independent operation of digital construction and in-class and out-of-class integration reform, making it difficult to form a synergistic effect. Second, the implementation of policies lacks effective supervision and evaluation mechanisms. Some colleges and universities only engage in “superficial promotion”, with the application of digital technology and the construction of in-class and out-of-class integration not being truly implemented. Third, there is a lack of policy linkage and experience exchange between different colleges and universities, making it difficult to form a development pattern of vertical and horizontal coordination and joint promotion.

### **4.2. Insufficient Adaptability of Digital Technology and Superficial Application**

Currently, the digital technologies and tools used in college physical education still face problems of insufficient adaptability and superficial application. First, the adaptability of digital tools to physical education teaching scenarios is low. Most online teaching platforms and sports apps are general-purpose products, lacking personalized design for specialized college physical education courses (e.g., aerobics, ball games, martial arts) (Huang et al., 2021), making it difficult to meet the needs of different specialized teaching. Second, the accuracy and convenience of sports data collection equipment need to be improved. Some devices have issues such as delayed data collection, large errors, and cumbersome operation, making them difficult to be widely used in the monitoring of students' in-class and out-of-class sports activities. Third, the application of digital technology mostly remains at the basic level, such as “check-in and push notifications”, lacking in-depth analysis and utilization of data. It is therefore difficult to accurately grasp students' sports status and learning needs through data, making it impossible to achieve personalized teaching and precise empowerment.

### **4.3. Insufficient In-Depth Integration of In-Class and Out-of-Class Teaching and Persistent Barriers**

The barriers between classroom teaching and extracurricular exercise in some colleges and universities have not been truly broken, and the degree of integration is insufficient. First, there is a disconnection in teaching content. Classroom teaching focuses on the teaching of sports skills, while extracurricular exercise content lacks targeted design and guidance, making it difficult to form an effective connection with classroom teaching content. As a result, students struggle to consolidate the skills learned in class during extracurricular time. Second, there is a disconnection in the teaching process. There is no effective linkage mechanism between classroom teaching and extracurricular exercise, teachers provide insufficient guidance on students' extracurricular exercise, and students' extracurricular exercise is mostly in an "independent and unorganized" state. Third, there is a disconnection in the evaluation system. Existing physical education teaching evaluation mostly focuses on classroom performance and physical health test results, with insufficient evaluation of students' participation in extracurricular exercise and exercise effects. This makes it difficult to exert the guiding role of evaluation and cannot effectively guide students to actively participate in extracurricular exercise.

### **4.4. Insufficient Digital Capacity of Teachers and Weak Supporting Role**

As the core implementers of digital empowerment for in-class and out-of-class integration, the digital capacity of physical education teachers directly affects the implementation effect of the path. Currently, the digital capacity of college physical education teachers is generally insufficient, making it difficult to meet the needs of digital teaching. First, most physical education teachers lack systematic digital teaching training, are not proficient in the use of digital technologies and tools, and cannot flexibly use digital means to carry out teaching or guide students' extracurricular exercise. Second, some physical education teachers hold outdated digital teaching concepts, are still accustomed to traditional teaching models, do not pay sufficient attention to digital technology, and lack the awareness to actively use digital technology to promote teaching reform. Third, colleges and universities lack a dedicated digital teaching guidance team, making it difficult to promptly address the problems encountered by physical education teachers in the application of digital technology, which restricts the effective application of digital technology.

## **5. Implementation Path of Digital Empowerment for the Integration of In-Class and Out-of-Class Physical Education Teaching in Colleges and Universities under the Physical Fitness Enhancement Program**

Combining the policy requirements of the Physical Fitness Enhancement Pro-

gram, the actual situation and practical difficulties of college physical education teaching, and based on the empowering advantages of digital technology, this study constructs a four-dimensional implementation path: “policy guidance, technical support, teaching integration, and guarantee protection”. This path aims to promote the effective implementation of digital empowerment for the integration of in-class and out-of-class physical education teaching in colleges and universities and help improve students’ physical health.

### **5.1. Policy Guidance Path: Strengthen Overall Planning and Promote Policy Implementation**

Policy guidance is the premise of digital empowerment for in-class and out-of-class integration. It is necessary to promote the effective implementation of relevant policies of the Physical Fitness Enhancement Program in colleges and universities by strengthening overall planning, improving the policy system, and enhancing supervision and evaluation, thereby providing policy support for digital empowerment.

First, strengthen overall planning and clarify development goals. Colleges and universities should incorporate the digital empowerment of in-class and out-of-class integration into the overall plan for physical education teaching reform, formulate targeted development plans and implementation guidelines based on the school’s educational level and resource endowments, clarify the goals, tasks, timetables, and responsible persons for digital construction and in-class and out-of-class integration reform, and promote the coordinated advancement and in-depth integration of the two. At the same time, an overall coordination group led by school leaders should be established, including relevant departments such as the Physical Education Department, Information Technology Department, and Academic Affairs Office. This group will be responsible for comprehensively promoting various tasks related to digital empowerment for in-class and out-of-class integration and coordinating the resolution of problems encountered in the promotion process (Yu, 2026).

Second, improve the policy system and refine implementation measures. Combined with the core requirements of the Physical Fitness Enhancement Program, colleges and universities should issue relevant supporting policies and refine the implementation measures for digital empowerment of in-class and out-of-class integration: clarify specific requirements for the construction of digital teaching resources, teacher training, and technology application; formulate quality standards for digital teaching and integrated in-class and out-of-class teaching, and standardize teaching processes and evaluation methods; establish an inter-university exchange and cooperation mechanism to promote experience sharing and resource complementarity between different colleges and universities, forming a development pattern of coordinated promotion.

Third, strengthen supervision and evaluation to ensure policy effectiveness. Establish and improve the supervision and evaluation mechanism for policy imple-

mentation, incorporate the progress of digital empowerment for in-class and out-of-class integration into the key content of college physical education teaching quality evaluation and teacher performance assessment, and regularly supervise, inspect, and evaluate the progress of digital construction and in-class and out-of-class integration reform. Introduce third-party evaluation institutions to objectively evaluate the effectiveness of digital empowerment, identify and rectify problems in a timely manner. Establish an evaluation result feedback mechanism, link the evaluation results with the school's resource investment and policy adjustment, and ensure the effective implementation of policies.

## **5.2. Technical Support Path: Optimize Technology Adaptability and Deepen Technology Application**

Technical support is the core of digital empowerment for in-class and out-of-class integration. It is necessary to give full play to the empowering advantages of digital technology and provide technical guarantees for in-class and out-of-class integration by optimizing technology adaptability, deepening technology application, and strengthening data utilization.

First, optimize technology adaptability and develop personalized digital tools. Promote the in-depth adaptation of general digital tools to college physical education teaching scenarios, and develop personalized digital teaching platforms and sports apps based on the characteristics of different specialized physical education courses. For example, develop action decomposition demonstration video platforms for aerobics courses, tactical analysis systems for ball games courses, and action correction systems for martial arts courses. Optimize the performance of sports data collection equipment, improve the accuracy and convenience of equipment, and develop lightweight and portable data collection devices to facilitate the real-time collection of students' in-class and out-of-class sports data. Promote data interconnection between different digital tools, realize the seamless connection of online teaching platforms, sports apps, and data collection equipment, and build an integrated digital teaching technology system (Han, 2025).

Second, deepen technology application and innovate teaching models. Relying on digital technology, innovate the college physical education teaching model and build an integrated teaching model of "online-offline integration and in-class-out-of-class connection": before class, teachers push teaching videos, knowledge points, and preview tasks through online teaching platforms to guide students to preview in advance and prepare for classroom teaching; during class, use somatosensory interaction technology, screen projection equipment, and other tools to assist classroom teaching, and provide real-time feedback on students' action completion through real-time data collection to help students correct incorrect actions in a timely manner and improve classroom teaching efficiency; after class, assign personalized exercise tasks and push exercise plans through online platforms to guide students to complete independent exercise in their spare time. Students upload exercise data through sports apps (Zhao, 2023), and teachers provide online guid-

ance and feedback on students' exercise status to realize the extension of classroom teaching to extracurricular settings.

Third, strengthen data utilization to achieve precise empowerment. Establish a digital database for college physical education teaching, integrate relevant data such as students' classroom performance, extracurricular exercise data, physical health test results, and sports skill mastery. Through big data analysis technology, accurately grasp students' sports status, learning needs, and physical health levels to push personalized exercise plans and teaching content for students. Use data to evaluate teaching effects, adjust teaching strategies and exercise plans in a timely manner, and optimize teaching processes. Through data mining, discover the laws and problems related to the improvement of students' physical health, and provide data support for the reform of college physical education and the implementation of the Physical Fitness Enhancement Program.

### **5.3. Teaching Integration Path: Break Internal and External Barriers and Achieve Coordinated Development**

Teaching integration is the core goal of digital empowerment for in-class and out-of-class integration. It is necessary to break the barriers between classroom teaching and extracurricular exercise and achieve the coordinated development of in-class and out-of-class teaching by integrating teaching content, improving linkage mechanisms, and optimizing evaluation systems.

First, integrate teaching content to achieve in-class and out-of-class connection. Based on the core requirements of the Physical Fitness Enhancement Program, combined with students' physical health levels and sports interests, integrate classroom teaching and extracurricular exercise content to build an integrated teaching content system: classroom teaching focuses on the teaching of sports skills and exercise methods, emphasizing the cultivation of students' sports skills and scientific exercise capabilities; extracurricular exercise focuses on consolidating what is learned in class, improving sports skills, and enhancing physical fitness, with targeted exercise content designed. For example, after learning basic aerobics movements in class, assign complete set of movement practice tasks after class to guide students to practice independently. Combine sports competitions, community activities, and other carriers to organically integrate teaching content with practical activities, stimulate students' enthusiasm for exercise, and achieve seamless connection between classroom teaching and extracurricular exercise.

Second, improve the linkage mechanism and strengthen extracurricular guidance. Establish a linkage mechanism between classroom teaching and extracurricular exercise, and strengthen teachers' guidance on students' extracurricular exercise: teachers provide extracurricular exercise guidance for students through online platforms, offline community activities, and other methods, and answer questions encountered by students during exercise; set up physical education learning groups to encourage students to supervise and guide each other and complete extracurricular exercise tasks together; use digital technology to realize teach-

ers' real-time monitoring and guidance of students' extracurricular exercise, ensuring the scientificity and effectiveness of extracurricular exercise; combine campus sports competitions, fitness check-in activities, and other initiatives to create a favorable atmosphere for extracurricular physical exercise and guide students to actively participate in extracurricular physical exercise.

Third, optimize the evaluation system and strengthen the guiding role. Establish an integrated digital evaluation system for in-class and out-of-class teaching, breaking the evaluation model of "valuing classroom over extracurricular" and "valuing results over process": incorporate students' classroom performance (action mastery, participation), extracurricular exercise status (participation frequency, duration, exercise effect), physical health test results, and sports skill improvement into the comprehensive evaluation system, and use digital means to realize the automatic collection and analysis of evaluation data; adopt a combination of process evaluation and summative evaluation, focusing on the evaluation of students' exercise process and progress; introduce multiple evaluation subjects, including student self-evaluation, peer evaluation, and teacher evaluation, to ensure the comprehensiveness and objectivity of evaluation; link the evaluation results with students' physical education scores, evaluation and selection, graduation requirements, and other factors, give full play to the guiding role of evaluation, and guide students to actively participate in in-class and out-of-class physical exercise.

#### **5.4. Guarantee Escort Path: Improve the Guarantee System and Strengthen the Supporting Force**

Guarantee protection is an important support for digital empowerment for in-class and out-of-class integration. It is necessary to provide all-round guarantees for the smooth advancement of digital empowerment for in-class and out-of-class integration by increasing resource investment, strengthening teacher training, improving technical guarantees, and improving incentive mechanisms.

First, increase resource investment and improve hardware and software construction. Colleges and universities should increase capital investment in the digital construction of physical education teaching, reasonably allocate funds for the purchase of digital hardware equipment, software resource development, and resource updates; equip complete digital teaching equipment, such as online teaching platforms, sports data collection equipment, somatosensory interaction equipment, and screen projection equipment, to ensure the normal application of digital technology; strengthen the construction of digital physical education teaching resources, integrate internal and external resources, build a resource library covering teaching videos, exercise plans, and knowledge points for different physical education specialties and difficulty levels, and realize the enrichment and diversification of resources; establish a resource sharing mechanism to promote the sharing of digital physical education teaching resources between different departments within colleges and universities and between different colleges and universities,

and improve resource utilization efficiency.

Second, strengthen teacher training and improve digital capacity. Establish and improve the training system for the digital capacity of college physical education teachers, and regularly organize physical education teachers to participate in digital teaching training. The training content includes digital technology application, digital teaching design, data mining and analysis, and other aspects to improve teachers' digital operation capabilities and teaching abilities; invite digital teaching experts and excellent teachers to give lectures and demonstration classes, share digital teaching experience and methods, and guide teachers to establish digital teaching concepts; encourage teachers to participate in digital teaching reform projects and research projects, and promote teachers to improve their digital capacity in practice; establish a teacher digital capacity assessment mechanism, incorporate digital teaching capacity into the key content of teacher performance assessment and professional title evaluation, and urge teachers to improve their digital capacity (Wang et al., 2024).

Third, improve technical guarantee and strengthen service support. Establish a dedicated digital technology maintenance team responsible for the daily maintenance and fault repair of digital equipment and platforms. Aiming at the problem of insufficient data collection accuracy of wearable devices and sports apps, strengthen equipment calibration and standardized guidance to improve data measurement validity, ensuring the normal application of digital technology and data reliability; establish a technical consultation and service mechanism to provide consultation and guidance on the application of digital technology for physical education teachers and students. At the same time, take into account the fairness of differences in students' equipment holding conditions, assist in solving the problem that some students cannot participate in digital teaching due to the lack of adaptive equipment, and reduce the "digital divide"; strengthen the safety guarantee of digital technology, address risks related to data governance, improve the data security management system, standardize the links of data collection, storage, use, and retention, clarify the hierarchical management of data permissions, implement the relevant requirements of respondents' informed consent, and ensure the safety of students' personal information and sports data; promote the continuous upgrading of digital technology, timely update digital equipment and software resources, keep pace with technological development, further avoid various technical application risks, and ensure the feasibility of the proposed digital evaluation and monitoring plan.

Fourth, improve the incentive mechanism and mobilize participation enthusiasm. Establish and improve the incentive mechanism for digital empowerment of in-class and out-of-class integration, commend and reward teachers who actively participate in digital teaching reform and promote the construction of in-class and out-of-class integration—such as preferential treatment in evaluation and selection, performance salary improvement, and external training opportunities—to mobilize teachers' enthusiasm and initiative; commend and reward students who

actively participate in in-class and out-of-class physical exercise and have achieved significant improvements in physical health—such as extra points in physical education scores and preferential treatment in evaluation and selection—to stimulate students' enthusiasm for exercise; encourage teachers and students to participate in digital teaching resource development, teaching model innovation, and other activities, reward excellent achievements, and create a favorable atmosphere of “everyone participates and everyone innovates”.

## 6. Conclusion

This study focuses on the implementation path of digital empowerment for the integration of in-class and out-of-class physical education teaching in colleges and universities under the Physical Fitness Enhancement Program. By adopting literature review, investigation, and systematic analysis methods, it sorts out relevant concepts and theoretical foundations, analyzes the current situation and existing problems of digital empowerment for the integration of in-class and out-of-class physical education teaching in colleges and universities, and constructs a four-dimensional implementation path of “policy guidance, technical support, teaching integration, and guarantee protection”. This research provides a new perspective and ideas for subsequent related studies, promoting the cross-integration of college physical education teaching theory and digital technology theory. At the same time, it provides operable and implementable practical guidance for colleges and universities, helping them break the barriers between in-class and out-of-class physical education teaching, optimize the physical education teaching model, improve the quality of physical education teaching, and promote the development of college physical education towards intelligence, personalization, and integration.

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## Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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