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## DEVELOPING A DIVERSIFIED EVALUATION SYSTEM OF STUDENT DEVELOPMENT: INNOVATION FROM EDUCATION INFORMATISATION IN CHINA

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## Abstract

With the assistance of big data technology, diversified evaluation methods are used as a baton to promote students' comprehensive development. Based on this, a new educational program for the new era faces challenges such as single evaluation dimensions, single evaluation subject, single evaluation approach, complex quantification and challenging collection of process data. Therefore, it is imperative to promote the reform of the evaluation system. Based on the diversified evaluation of the educational background, this paper adopts the research and case study methods and combines qualitative and quantitative methods. Students, teachers, families, and schools are taken as evaluation subjects. Students' moral, intellectual, physical, aesthetic, and labour development process data are collected, shared, and analysed. Finally, referring to practical cases, a complete data chain and theoretical analysis basis is formed, effectively supporting diversified evaluation, promoting the integration of five aspects of education and generating evaluation reports and development predictions.

*Keywords:* student evaluation, diversification, big data, integration of five aspects of education

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## 1. INTRODUCTION

Primary, secondary, and higher education include the three core levels of China's educational system (ChinaPower, 2017). All students in China are mandatory to complete six years of primary school. Lower secondary (junior high) and upper secondary (senior high) are the two secondary education levels in China. Students can continue higher education in universities and colleges after completing secondary school.

China has used a variety of educational initiatives to improve learning quality and support students' overall development (Cheng, 2020). These methods include developing collaborative problem-solving abilities, inquiry-based learning, and student-centred learning. The Chinese government also stresses using technology in the classroom to improve digital literacy and prepare students for the contemporary world.

In the Chinese educational system, traditional culture is critical. Students are taught the Confucian virtues of respect, filial piety, and diligence, which help to mould their character and moral compass. To conserve and develop cultural history, Chinese schools frequently integrate traditional arts, calligraphy, and martial arts (Bao, 2022).

Through a variety of strategies, the Chinese educational system motivates pupils. High-achieving kids are recognised and given prizes for their academic success. Additionally, extracurricular activities are encouraged to help kids discover their interests and abilities outside the classroom. Schools often provide counselling and support services to meet students' emotional and intellectual requirements (Xia, 2020).

Diversification in education refers to using various evaluation methods considering different facets of a student's growth. This covers academic achievement, interpersonal abilities, creativity, and emotional quotient. Diversified evaluations, such as portfolios and project-based exams, provide teachers with a complete picture of the skills and potential of their students (Mok & Marginson, 2021).

The need for diversity in education stems from the recognition of the individual abilities and learning preferences of each student. Various evaluation techniques can help teachers better understand each student and adapt their instruction to their unique requirements. Additionally, the stress of standardised testing is lessened through diverse evaluations, fostering a supportive and welcoming learning atmosphere where all kids may succeed (Tsibizova, 2019).

Diversifying assessment methods entails using a variety of approaches to measure student growth and progress fully. Students can demonstrate their abilities and knowledge through practical assignments, presentations, or simulations by using performance-based evaluations, enabling teachers to see how well-versed topics are applied in the real world. As students work on challenging projects, project-based learning promotes critical thinking, teamwork, and creativity, deepening student grasp of the material and problem-solving skills. A comprehensive assessment of a student's development and accomplishments is made possible by their portfolios, which are a rich collection of their work in various areas and abilities.

Additionally, promoting self-evaluation and reflection encourages students to actively participate in tracking their educational progress. Students become more self-directed and motivated learners by establishing objectives and reflecting on their development. Formative evaluations, which give students frequent and continuing feedback, are equally crucial to self-assessment in the learning process. These evaluations highlight areas that require work, enabling teachers to successfully adapt their lessons to fit students' particular learning requirements.

Various evaluation techniques are used in the educational environment in China to gauge student learning. Standardized exams are common assessments of students' knowledge of academic subjects that offer a uniform standard against which to compare results. Teachers create evaluations, such as examinations and quizzes, to determine how well their pupils understand a subject. Insights into academic performance on a larger scale are provided through national and regional tests at certain educational levels, allowing education authorities to spot patterns and solve systemic problems.

Various variables are used in China's diverse assessment system to evaluate student growth thoroughly. One of these measures is academic success, measured by traditional subject-based grades and test results. Additionally, the evaluation method considers markers for kids' social and emotional

growth, rating their social skills, emotional intelligence, and empathy. Creativity and critical thinking are assessed, emphasising students' capacity for critical thought, creative problem-solving, and innovative learning strategies. Students' general health and physical fitness are considered, along with their physical health and well-being. Last, the assessment method evaluates moral and character development, including values, ethics, and integrity, as crucial facets of student development.

This paper presents an innovative approach to student assessment using multi-dimensional data and evaluations in China's Grade 1-12 schools. Against the backdrop of education informatisation, an integrated assessment system can include multi-dimensional data from school management, teaching, and learning, which contrasts with the reliance on single-dimensional inputs in traditional evaluations. This study explores an integrated student assessment system that is suitable for the basic education cycle. The multidimensionality not only refers to various learning inputs but also addresses the richness of data in each input. For example, student evaluation can include self-evaluation, peer evaluation, and teacher evaluation. The final evaluation would be a weighted result combining quantitative and qualitative effect analysis, and the weight allocation is data-driven.

This paper expounds on the techniques of the integrated assessment system in detail. Specifically, this study focused on targeted homework, stratified teaching, and data forecast as research subjects. The assessment system breaks down information barriers for targeted homework and is applied to different learning stages. To enrich student assessment portraits, the system collects data on student behaviour in the learning preparation, teaching, and post-class stages. To effectively apply the integrated evaluation, it is necessary to integrate general information about students, moral education performance, academic performance, and mental health information. Through three-dimensional real-time evaluation and recording of moral, intellectual, physical, and aesthetic behaviour, this system forms a comprehensive portrait of students to transform data into personalised teaching resources with timely feedback. Spring Boot, Spring Cloud & Alibaba, Vue, Element, and other digital technology are used to build resource pools, form micro-lessons divided by knowledge points, form online resources, and realise self-directed learning. The distributed ledger recording technology based on blockchain records teaching data and ensures the quality of teaching resources and traceable intellectual property rights. To build school-based teaching resources, educators need to mark attributes for every knowledge point the information system uses. The system can automatically recommend targeted homework for students through the above resources. The data-driven assessment system locates the actual learning status of students, analyses the root causes of learning obstacles, recommends knowledge points from the resource pool, and accurately provides reports and consolidation exercises from school-based resources. At the same time, the assessment system tracks and monitors each student's learning over time.

The integrated assessment system also provides a practical solution for differential teaching and learning. In "Vision 2020: Report of the Teaching and Learning in 2020 Review Group" of the UK, differential teaching was defined as a highly organised and interactive evaluation method which pays more attention to the individual development of students and helps each student tap their potential, and obtain learning achievements to actively integrate into the society and move towards success in the future (GTCE, 2020). Implementing differential teaching for every student is challenging, especially considering the large effect size in Chinese classrooms. However, the integrated assessment system in this study enables the stratification of learning into three to five manageable layers to improve the

teaching quality. Blockchain technology, decentralised consensus mechanism, and innovative contract technology help deliver teaching by suggesting teaching strategies and arranging teaching resources and tasks, facilitating teaching without compromising teachers' autonomy. The big data prediction method deals with data and builds analysis, prejudices learning characteristics, makes path and plan suitable for the growth of students and development of learning, monitors the learning process and learning state, and forecast the potential of students interested in values and science. The forecast data provides rationalisation and personalised targets and accurately adjusts learning solutions.

## 2. LITERATURE REVIEW

In October 2020, the Central Committee and The State Council issued the General Plan for Deepening the Reform of Educational Evaluation in the New Era, which proposed to improve the outcome evaluations, strengthen process evaluations, explore value-added evaluations, to enhance comprehensive assessments and to increase the rigour, professionalism, and objectivity of educational evaluations by taking advantage of information technology and resource-sharing platforms (Dongxian, Xingcheng, & Rui, 2021). Against this backdrop, Susu (2022) made practical innovations by deepening the process evaluation by using classroom performance, such as homework accuracy rate and classroom participation, which expanded dimensions through discipline exhibition and evaluation activities. Additionally, they made use of big data technology to generate personalised reports. Luo et al. used an incremental learning algorithm to construct a prediction model of students' scores for two semesters (Yangyang, 2021). Hoffer et al. (2011) provided students' learning trajectories according to their past scores. However, the value-added evaluation system of students emphasises the attention to the development of each student. A single performance does not evaluate students' progress, and the results are more used to evaluate teachers and school efficiency. As for how to promote the overall development of students through a value-added evaluation, there needs to be more specific research on it (Xiaorong & Huirong, 2021).

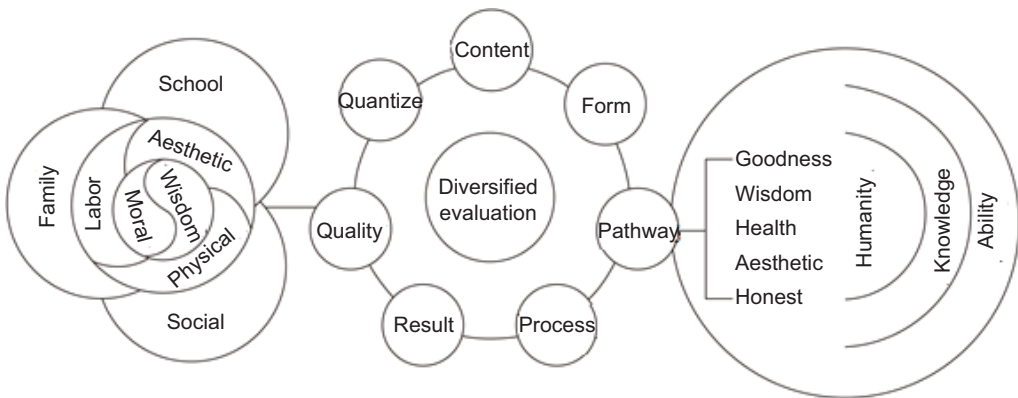
The current comprehensive evaluation of students still needs to be improved, mainly reflected in the lack of diversified assessment of students' moral education, aesthetic education, physical education, labour education, and other dimensions (Jingyu, Xinrui, & Lanxiang, 2020). It still focuses on the academic component and needs to realise the developmental evaluation and prediction of the integration of five education. Collecting educational behaviour data could be more efficient, and there needs to be a platform for scientific analyses. In addition, more data collection and value-added analysis need to be collected, which cannot predict students in different trajectories.

The technology of big data is gradually improving at present. The shared resources of five education are popularising, making it possible to discover the internal connection between different qualities and carry out diversified evaluations oriented to the teaching process and results (Yin & Ying, 2017). This paper actively explores the data collection, mining, modelling, and prediction of trajectories in academic, moral, physical, and labour development based on big data technology to realise the resource sharing of process behaviour, optimise the evaluation system, and discover the purpose of the integration of five education. In the process of exploration, based on the existing difficulties, the Author expounds on the implementation of the integration of five education from

the research and application of multiple evaluation systems and carries out the total factor evaluation of academic, moral, physical, and labour development from an overall view.

### 3. FRAMEWORK: FROM MULTI-DIMENSIONAL INPUTS TO DATA-DRIVEN OUTPUTS

Five education is paying attention to more than just morality, intelligence, and physique content. More attention should be paid to the integration between five educations. It makes five education mutual penetration, mutual coordination, and generating a new composition (Bentao, 2020). The relationship between each evaluation index is shown in Fig. 1, with “education integration” as the teaching content. The evaluation framework is family-based, school-based, and community-oriented. The three parties tighter cultivate students with international vision, overall quality, and knowledge of China. The middle part of the figure indicates that the process and outcome evaluations are obtained from the content, format, and process of evaluation, combining qualitative and quantitative methods according to the diversified evaluation system of students. The last circle shows cultivating students with humanity, knowledge, and ability represented by kindness, wisdom, and honesty from multi-dimensional inputs. Inputs, including data from moral education, intelligence education, physical education, aesthetics education, and labour education, support the development of the whole life. “One education” infiltrates “five education”. Its process and behaviour all reflect the quality and ability of all aspects. “Five education” guides “one education”, the ability of students to deepen their knowledge of all aspects of cognition. As Fig. 1 shows, family, society, and school should be responsible for cultivating talents. Moral education is the foundation of five education. Morality determines intelligence improvement. Sima Guang pointed out in His Book “The Mirror of Wisdom”: “Talent would be endowed with virtue. Outstanding students need to be possessed of both integrity and ability.” A healthy body and mind need moral education support (Feng, 2020; Weiming & Jihua, 2010). Moral education helps to cultivate a pragmatic, dynamic quality of labour. Intellectual education assists moral education and provides a rational basis for moral education. It



**Fig. 1** Integration of five education and multiple evaluations.

provides a scientific method for physical education and motivation for aesthetic education. Also, through labour education, develop the ability to harvest. The body is the material foundation of human development. Labour education cultivates a sense of morality. Through labour education, students can strengthen their knowledge and enhance academic performance. They help improve physical fitness and correct aesthetic consciousness and judgment ability. The five education complement each other and bring out the best outcome in each other. Based on the education fusion of nature and the importance of diversified student evaluation, this study presents an evaluation system from the point of value education. Guided by the study, we developed an evaluation system to collect student behaviour data (Yi & Yiping, 2021). Using the multi-dimensional evaluation method, we set up the student behaviour index of total factor, the formation of multiple evaluation concepts and processes, to realise students' human nature, knowledge, and ability.

#### **4. INPUTS FIVE EDUCATION**

The evaluation system integrates the “Five Educations” in the national curriculum and collects data on student behaviour in the learning preparation, teaching, and post-class stages. To effectively apply the integrated evaluation, it integrates general information about students, moral education performance, academic performance, and mental health information. Five educations shape each other, and both shape instruction. The five education integration leads to such different instructional outcomes as contents covered, pedagogies, and development of students. Diversified evaluation is framed by content, form, and pathway. To keep human nature, evaluation adopts process and result methods. Through five education, it can enhance knowledge. Using multiple evaluations is finally to facilitate ability improvement.

##### **4.1 Moral Education Evaluation of Students**

Moral education in China enhances morality, ideology, politics, and mental health (Ye 2014). Moral education evaluation fully embodies cultivating talents and paying tribute to learning. The current moral education curriculum in China is compulsory from grade 1 to grade 12. As we all know, the moral education evaluation of students is not just measured by the score of the curriculum. Unlike academic data that can be directly quantified, it mainly adopts the means of quality evaluation and quantification as supplementary. The focused qualitative evaluation process has the shortcoming of high reliance on individual judgments with solid subjectivity. Thus, doing all accurate quantitative evaluation information is impossible. Based on data collection requirements of objectivity and operability, big data technology can assign a moral education evaluation index system to provide a simple, comprehensive, convenient management evaluation environment. Moral education research can be completed from subjective quality evaluation and quantitative evaluation. Qualitative evaluation data is collected from self-evaluation, evaluation of others, and observation records. Also, students' process data in moral education, such as students' family background, teachers and schools, and others, affect students' behaviours indirectly.

##### **4.2 Basic Index**

Fundamental indicators are set based on the social value judgment of moral education activities according to social needs including ten elements of honest quality and civic literacy, all subjective



**Table 1** Moral Quality and Civic Quality.

Factor	Key Performance
Love the Motherland	Inheriting traditional virtues, carrying forward the national spirit, and having a sense of pride and responsibility for the motherland. Safeguarding national unity and national interests.
Respect Teachers and Unite Students	Be polite to teachers, get along well with classmates, and be willing to help classmates.
Industry and Enterprise	Aggressive and hardworking in the study. Define learning and development goals.
Honest and Trustworthy	Don't cheat, be honest. Don't do things at the expense of others, and keep your word.
Concerned about the Collective	Willing to participate in group activities. Cherish collective honour and safeguard collective interests.
Love Laboring	Take an active part in labour within your power.
Sense of Social Responsibility	A desire to serve others and the community. Actively participate in community service activities and care about society and others.
Self-confidence and Self-esteem	Take personal responsibility for your actions. Correct mistakes and accept yourself.
Striving to Improve Self-discipline	Have a sense of rules, abide by the law, consciously complete learning tasks, and resist temptations.
Environmental Awareness	Knowledge of environmental protection. Actively participate in environmental protection activities to maintain environmental hygiene.

indicators, as shown in Table 1 below (Dongxian, Xincheng, & Rui, 2021). As can be seen from the dimensions listed in the table, the evaluation audience is students, and the evaluation subjects can be students, parents, and teachers. The evaluation types are self-evaluation and other evaluations. The diversity of indicators and the multiple topic types differ from a single data source. Students use the platform of additional assessment, self-evaluation, and mutual assessment from various perspectives, leaving traces in the process, accumulating big data, and forming electronic evaluation files, making the qualitative assessment more accurate, rational, scientific, and efficient. There shows us every factor, including crucial performance.

### 4.3 Developmental Index

To establish a quantifiable evaluation index system, it is necessary to clarify which students' daily behaviours can be collected, analysed and predicted to the requirements of the Comprehensive Evaluation Index Framework for Primary and Secondary Education Quality (Trial) issued by the Ministry of Education, negative and positive developmental indicators can be determined and constantly adjusted and optimised in the application (Jinian & Xinhua, 2022). It is designed based on four aspects of students' moral structure: moral cognition, moral behaviour, moral emotion, and moral will. The developmental index includes six first-level indicators: campus life behaviour, daily duty, discipline and self-discipline, self-appearance and bearing, civilisation, and politeness.



According to the semester-set percentage system, schools can vary according to the first level of indicators refined. We cannot require all schools to have the same content, index, and method of moral education. We neither require all students to be the same according to one standard, which ignores their differences. Therefore, applying appropriate evaluation is the best and fairest for development. With the help of a digital platform, quantitative records can be obtained. The quantitative change also curves within a certain period, and the analysis results can be obtained with the other five indicators. For example, the quantitative curve of moral education fluctuates wildly. In variety with the other five education behaviours, such as the student's academic and psychological changes, the school will analyse the reason for the fluctuation caused by family relationships, which provides supportive guidance for the school and family to guide communication further.

In a fundamental sense, qualitative and quantitative evaluation ultimately point to moral cultivation, the foundation of five education. Moral education evaluation is not to prove students' moral awareness but to improve their ability to know right from wrong. Moral education may have a short-term effect but could generate a long-term influence. A scientific and practical qualitative and quantitative evaluation system provides development data to teachers and students.

Education management help optimises moral education work, not only needs to combine it with other education behaviour but also needs to integrate it into the guidance of other education to promote the development of students effectively.

#### 4.4 Evaluation of the Student Intellectual Education

The second important factor of a diversified student is the evaluation of academic education. Intellectual education is different from academic achievement. We should not only focus on students' literacy, science literacy, core academic performance, weakness in knowledge, and aspects such as the advantages and disadvantages in the test data but also need to make regular and subjective evaluations of their thinking ability, innovation ability, etc. This paper proposes to use big data to bring the learning process behaviour and the summative evaluation into the evaluation scope. It emphasises the interaction between the evaluator, the evaluated object, and the specific evaluation environment, reflecting the value of the intellectual education process.

#### 4.5 Process Evaluation

Students' academic education process is reflected before, in, and after class. The students' process behaviour takes disciplinary core and student core as the top-level structure. It integrates disciplinary accomplishment, student accomplishment, classroom performance, and homework feedback into the evaluation process to realise the collection and analysis of data in the whole learning process. The platform uses information to record classroom performance, homework, disciplinary activities, reading literacy and academic level (Jiang & Zeng, 2019). Use data mining to show students' comprehensive literacy level. Classroom teaching evaluation has become an indispensable and essential component in deepening the understanding and practice of classroom teaching reform (Lan & Yaping, 2003). Classroom performance evaluation includes quantitative evaluation of five indexes, ability to think, expression, respect, curiosity, and devotion. These specific data are specially classified, sorted out, collected, and statistically analysed. It also provides the basis for labour, physical, aesthetic, and moral education. By evaluating the subject literacy and gathering the learning process

data of various subjects, the comprehensive, dynamic, and systematic analysis of students can be realised to help students to diagnose and improve their learning problems. The process evaluation discovers their preponderant discipline and guides the comprehensive development of students' literacy ability. With the help of big data analysis measures, record the situation of students' mistakes and analyse the root causes of wrong assignments. The reasons for mistakes include inaccurate calculation, unclear thinking, incomplete examination, poor process, inactive method, unclear knowledge, poor consideration, and so on. Data mining is used to analyse the mastery of "source knowledge points" and push "weak knowledge" assignments to students. Compared with the traditional evaluation method of knowledge mastery, the push of targeted knowledge points is more accurate and effective, and the effect of individualised teaching is more evident in the process evaluation obtaining a large amount of data for process evaluation (Yinuo, 2021).

The comprehensive literacy level of students is displayed in the way of data mining (Castellano & Ho, 2013). Classroom teaching evaluation has become an indispensable and essential component in deepening the understanding and practice of classroom teaching reform (Lijian, 2013). Classroom performance evaluation includes quantitative evaluation of two forces and three attitudes: thinking, expression, respect, curiosity, and devotion. These specific data are classified, sorted, collected, and statistically analysed. It also provides the basis for labour, physical, aesthetic, and moral education. By evaluating the subject's literacy and gathering the learning process data of various subjects, the comprehensive, dynamic, and systematic analysis of students can realise to help students to diagnose and improve their learning problems, discover and enhance their subject advantages and guide the comprehensive development of students' ability literacy. The help of big data analysis means recording students' wrong questions and analysing the root causes of inappropriate questions. The wrong questions include inaccurate calculation, unclear thinking, preliminary examination, poor process, static method, fuzzy knowledge, and poor consideration. Data mining is used to analyse the mastery of "source knowledge points" and push "weak" questions to students. Compared with the traditional evaluation method of knowledge mastery, the push of targeted knowledge points is more accurate and effective, and the effect of individualised teaching is more prominent (Liping, 2018).

#### 4.6 Outcome Evaluation

The academic analysis and diagnosis system based on a big data environment enables a comprehensive analysis of students' learning status and subject situation. Researchers in the US used "growth percentiles" to show students' academic results straightforwardly and predicted learning trajectories using performance data (Castellano & Ho, 2013). They also used performance dashboards to monitor individual students' performance's stability, advantages, and disadvantages, constituting a scientific basis for automated academic guidance reports. In addition to the performance dashboards provided by the above big data platform, the academic prediction function provided by an in-depth study of the performance data is also a primary use of educational big data (Lijian, 2013). When students apply for high schools and colleges, the three-year big data analysis of student status and subject change report can provide sufficient data support and constructive guidance. The change in students' scores on different tests is of specific significance to support exceptionally high school students to select courses and choose majors.

## 5. EVALUATION OF STUDENT PHYSICAL, AESTHETIC, AND LABOR EDUCATION

Physical, aesthetic, and labour education are essential contents of students' portraits. This paper puts these three educations together because they have common attributes. They all cultivate students' ability and consciousness of social characteristics in the education process. The critical task of physical education is to develop students' spirit of striving for progress and exercising their bodies. Aesthetic education cultivates students' noble aesthetic interests and enhances their ability to transmit aesthetics. Labour education develops students' character of bearing hardships and standing hard work and improves the ability to hands-on operation. We set up two data index databases similar to the moral education evaluation, fundamental and developmental indicators. There are four qualitative evaluation items: physical health, aesthetic taste, healthy lifestyle, artistic activities, and performance. The developmental indicators include quantifying mental health, physical health, labour participation, and aesthetic education courses.

### 5.1 Qualitative Evaluation

Physical education class is the basis of "physical education". With the help of the evaluation index of physical education class management-physical, education routine content, physical classroom environment, physical classroom activities and physical classroom problems-the, quality can be evaluated, also combined with physical classroom teaching objectives, classroom rules, physical environment, psychological environment, physical activity exercise amount, training intensity, training results, skills mastery, organisation, and coordination ability and other refined indicators for subjective judgment (Yi, 2021). "Aesthetic education is aesthetic education and sentiment education and spiritual education. It can improve people's aesthetic quality and influence people's emotion, interest, temperament, and mind imperceptibly, inspire people's spirit and warm people's heart." Aesthetic education evaluation is a lever to leverage the implementation and development of aesthetic education for everyone. Its evaluation standard is the objective of aesthetic education, namely, "improving students' aesthetic and humanistic qualities"(Lingli & Qi, 2021). The quality assessment process of aesthetic education is not only reflected in art; artistic quality and humanistic quality are also a part of aesthetic education. So, the aesthetic quality qualitative index, namely the aesthetic cognition, aesthetic experience, aesthetic expression, and aesthetic creativity, is used to promote the development of students' "comprehensive quality" (with aesthetic education, to open, beautiful body and beautiful beauty), and then to promote the development of professional art quality and achieve the goal of "enhancing aesthetic and humanistic quality".

In July 2020, the Ministry of Education issued the Guiding Outline for Labor Education in Universities, Primary and Secondary Schools (Trial)(Feng, 2020). It proposed making full use of modern information technology to conduct labour education evaluation, give play to the function of education guidance and feedback improvement, and systematically record labour process data. The four aspects of students' mastery of labour knowledge, labour skill training, emotional experience, and accomplishment generation in labour education promote the reconstruction of evaluation power relationships among the school, family, students, and society. It encourages the development of students' labour accomplishment by sharing evaluation power and participating in students' labour value orientation.

## 5.2 Quantitative Evaluation

The physical measurement system supported by big data comprehensively collects primary data on students' participation in teaching activities and physical fitness testing activities through intelligent physical education teaching equipment, physical fitness testing equipment, and intelligent wearable devices and automatically generates physical health analysis reports. The physical fitness change process and results are continuously tracked based on attendance, vision, and physical strength data. The data platform provides evaluation tools; the scores show students' psychological state during a specific period. The platform sets up crisis warnings, notifies and pushes "problem students", and quickly helps schools, parents, and students clear psychological barriers.

Improving the management of aesthetic education includes evaluating aesthetic education in student education and evaluation. The course selection system offers music, fine art, calligraphy, and other arts, implements credit system management, and combines classroom performance and artistic practice with quantitative evaluation. It also refers to the evaluation index system listed in The Measures for The Assessment of Art Quality of Primary and Secondary School Students issued by the Ministry of Education in 2015 (after this referred to as the Measures) as shown in Table 2, as well as the more mature course goal-oriented and technical monitor-oriented methods to further improve and optimise, through the data platform for process collection (Jinfeng, 2021; Ruiyi & Hongping, 2021). The "four in one" method, namely students' self-evaluation, other evaluation, teacher evaluation, and parent evaluation, was used to quantify the non-classmate segment. The comprehensive quality evaluation system includes evaluating artistic and humanistic quality. According to the Measures, the school establishes detailed rules for evaluating school-based art appreciation courses, aiming to comprehensively understand and master students' artistic quality development status after class.

**Table 2** Primary and Middle School Students Art Quality Evaluation Index System.

First Indicator	Secondary Indicators	Indicator Content	Score
Basic Indicators	Course Study	Attendance, participation, and completion of learning tasks in music, art, and other art courses.	25
	Extracurricular Activities	Participation in art interest groups, art societies, and various art activities organised by the school.	15
Academic Indicators	Basic Knowledge	Understanding and mastery of the basics required by the standards of music, fine arts, etc.	25
	Basic Skills	Mastering and using the basic skills required by the music, art, and other arts curriculum standards.	25
Development Indicators	External Study	Independent participation in art learning and art practice outside school (mainly refers to participation in community and rural cultural and art activities, learning excellent ethnic and folk art, appreciating elegant artistic performances and exhibitions, etc.).	8
	Artistic Expertise (bonus points)	Expertise in an art project (including vocal music, instrumental music, stage, drama, traditional Chinese opera, painting, calligraphy, etc.) shown in the school's on-site evaluation.	10

Integrating big data technology and labour education evaluation to achieve effective connection and integration of data collection, analysis, and assessment improves evaluation efficiency (Huan & Dequan, 2019). Technology empowerment emphasises using educational big data and visualisation technology to comprehensively collect and record students' labour education curriculum behaviour and practice activities and intuitively display development tracks. Students evaluate labour education through data flow and self-perception to stimulate self-awareness and strengthen labour values. In the implementation process of labour education, the Internet technology and emotion recognition technology are used to collect the labour literacy data of students in the classroom, campus, and other multiple times and spaces, which further cleans summary data to explore association and cohesion, and then displays quantitative data of labour behaviour and labour literacy level.

### 5.3 Output Student's Developmental Trajectory

Through three-dimensional real-time evaluation and recording of moral, intellectual, physical, and aesthetic behaviour, this system forms a comprehensive portrait of students.

The system uses blockchain technology with hard-to-tamper and traceability features to the forecast model. Big data prediction models process student behaviour data and analyse learning characteristics, suggesting suitable growth, learning, and career development paths for students. Students' academic education process is reflected before, in, and after class. The students' process behaviour takes disciplinary core and student core as the top-level structure.

It integrates disciplinary accomplishment, student accomplishment, classroom performance, and homework feedback into the evaluation process to realise the collection and analysis of data in the whole learning process. To build school-based teaching resources, educators need to mark attributes for every knowledge point the information system uses. The system can automatically recommend targeted homework for students through the above resources. The data-driven assessment system locates the actual learning status of students, analyses the root causes of learning obstacles, recommends knowledge points from the resource pool, and accurately provides reports and consolidation exercises from school-based resources. At the same time, the assessment system tracks and monitors each student's learning over time. The data platform provides evaluation tools; the scores show students' psychological state during a specific period. The platform sets up crisis warnings, notifies and pushes "problem students", and quickly helps schools, parents, and students clear psychological barriers. A construct prediction model includes an academic prediction model, psychological development prediction model, career planning model. Big data prediction technology predicts students' potential interests, scientifically guides students' learning and development direction, provides reasonable suggestions and makes personalised goals.

## 6. IMPLEMENTATION STRATEGY OF EVALUATION SYSTEM

In this article, a K-12 private education group carries on the practice of multi-stage, comprehensively and objectively recording growth trajectory. The accumulation of multi-dimensional data on students' growth supports for evaluations, including basic information from more than 30000 articles, moral education evaluation data from more than 12000 articles/semester, academic evaluation data,

psychological analysis data from more than 36000 articles/semester, article 50000/semester sports evaluation, more than 10,000 labour practice activities/semester. In addition, more than 3 million pieces of data are collected each semester, including health records, course selection records, and satisfaction summaries. It can also produce sub-reports, including students' moral education evaluation reports, physical quality analysis reports, curriculum quality lists, practical ability comprehensive evaluation reports, psychological quality evaluation reports, etc. Big data "navigate" the growth of students and "predict" students' future development trends, as shown in Table 3. The evaluation system and innovative application of big data technology actively implement the integrated development of education, explores the construction of a complete data collection chain, form scientific and practical diversified evaluation indicators, and predict the development of different stages (Zhiting & Chaohong, 2020).

### **6.1 Integration of Five Education, Construction of Data Chain, and Formation of Evaluation Basis**

The contents of the "five Education" not only pay attention to the "goodness", "truth", "health", "beauty," and "reality" reflected in the subject content of morality, intelligence, physique, beauty, and labour but also pay more attention to the cross and mutual penetration of the "five education". "Fusion" is not simply juxtaposing or complementing but generating a new organic whole through the joint aggregation and penetration of data between the five educational institutions. A complete and accurate data chain is provided to share total factor resources and form scientific and practical evaluation information in practical application. Compared with the traditional subjective judgment and single data analysis, big education data is collected in the natural scene the whole education in the teaching process of static and dynamic data, using the computer, artificial intelligence in the process of education and learning activities of feedback data in-depth mining, can create the data content related to their education practice, combing with the implicit education, And through visual means to show the evaluation dimension and scope.

The collection and analysis of the data of the whole process of the five educational behaviours promote the transformation of the academic evaluation method from the traditional "empiricism" to "scientism" in the era of big data and promote the comprehensive development of students.

## **7. DIVERSIFIED EVALUATION, WHOLE PROCESS RECORD, AND FORM EVALUATION REPORT**

Another calling of integrated development is comprehensive quality. "The so-called comprehensive quality is the inherent, organic and integrated overall quality presented by a unique individual", which is an evaluation of a "holistic recognition" (Zhijun & Hongxia, 2018). Therefore, the work of integrating the five educations cannot be done separately. It should maintain the uniqueness of each instruction and infiltrate the integration. Diversified evaluation is based on multi-dimensional data and provides students with evidence and support. Using the data from the big data platform to record student education and "multi-dimensional data" to penetrate the evaluation process so that comprehensive, long-term, continuous data resources can be utilised to undertake a more thorough

**Table 3** School evaluation index system.

First-level	Second-level	Third-level	The detail	Informatisation system	Score rules
Moral (25%)	Moral quality and civic quality.	Love the motherland.  Dear teachers, classmates United, courtesy of others.  Diligent and enterprising	Inheriting traditional virtues, carrying forward the national spirit, and having a sense of pride and responsibility for the motherland, safeguarding national unity and national interests.  Be polite to teachers, get along well with classmates, and be willing to help classmates.  Diligent and enterprising, with a solid drive to learn and develop. Clearly defined learning and developmental goals are established.  Honest and trustworthy, with a sincere approach to others and a commitment to avoid cheating and uphold one's promises. No selfish actions are taken, and promises are kept.  Cares for the community and enjoys participating in group activities. Cherishing collective honour and safeguarding collective interests.	A1. Subjective assessment. A2. moral education assessment system.	A total mark of 100 points in the comprehensive quality assessment manual, a B will be deducted 1 point. Then the student's points will be deducted from the moral education evaluation system.
	Caring for the collective.	Honest and trustworthy.	Actively participating in labour to the best of one's ability.		
	Love of labour.	Social responsibility.	A desire to serve others and society. Values the collective honour and interests and actively participates in community service activities to demonstrate social responsibility and concern for others.		

*(continues)*



Table 3 Continued.

First-level	Second-level	Third-level	The detail	Informatisation system	Score rules
		Self-confident and self-respecting. Self-disciplined and self-motivated.	Taking personal responsibility for one's actions. Willing to accept and correct one's mistakes. Self-disciplined and self-motivated, with a sense of rules and regulations, consistently following the law and fulfilling study tasks, and resisting negative temptations.		
		Environmental awareness.	Environmental awareness is present, with a basic understanding of environmental protection principles. Actively participates in environmental protection activities and strives to maintain environmental cleanliness.		
Intelligence (25%)	Learning ability.	Study interest.	Demonstrates an interest in learning, with a sense of curiosity and a desire for knowledge. Efforts are made to overcome learning difficulties.	B1. Classroom performance of the students. (15%)	<p>1) The average score of class performance: thinking ability, expression ability, engagement, respect, and curiosity.</p> <p>2) Thinking ability: divide the sum of all the recorded scores (without differentiation by subject) by the total number of records. The final score for cognitive ability: <math>A/3*100=B</math>.</p> <p>3) The same logic applies to the display of expression, engagement, respect, and curiosity.</p>

Study Methods.	Effective learning strategies are mastered. Different learning methods are employed to improve one's learning level.	B2. Regarding completion of assignments. (20%)	1) The sum of all recorded scores in all subjects (without differentiation) divided by the number of records $A/1 * 100 = B$ 2) The final score is the average of the scores in all subjects. Calculate the exam scores by dividing the score earned by the total score and multiplying it by the evaluation score. Subject activities are scored based on the number of recorded entries.
Planning and reflection.	Effective learning plans are established. Reflection and feedback are used to improve learning, and advice from others is considered.	B3. Regarding academic performance. (60%)	
Independent research.	Independent thinking skills are developed, with the ability to identify and solve problems. Exploration strategies and methods are mastered, and initial research and innovative capabilities are developed.	B4. Frequency of participation in subject activities, performance, etc. (5%)	
Team spirit.	Be able to use various communication methods comprehensively to communicate and cooperate. Willing to achieve collective goals and work well with others to complete tasks.	C1. "Handbook for Comprehensive Evaluation of Primary and Secondary School Students". (C1)	Overall evaluation has a B grade deduction of 1 point.
Communication and sharing.	Students can evaluate and regulate their behaviour. Good communication and sharing skills are demonstrated, and others are respected and understood.	C2. According to a teacher, classmates, and parental evaluations. (C2)	Evaluate according to the levels of ABCD.
Exercise and health.	The student has good physical fitness and possesses the ability to exercise and specific athletic skills. The student's mental health level is also good.	C3. According to "National Student Physical Health Standards", testing data.	Score according to the "National Student Physical Health Standards".
Physique (25%)	Communication and cooperation.		

(continues)

Table 3 Continued.

First-level	Second-level	Third-level	The detail	Informatisation system	Score rules
		Healthy lifestyle.	The student has developed a habit of exercising regularly and actively participates in sports activities. There are no bad habits, and personal hygiene is maintained.	C4. Based on psychological health evaluation data.	Mental health score.
Aesthetics (25%)	Aesthetics and expression.	Aesthetic taste.	The student appreciates the beauty in life, nature, art, and science. A healthy aesthetic sense is developed, with an ability to identify and appreciate beauty.	D1. Regarding participation in cultural and artistic activities in the city, district, school, community, and rural areas (50%).	Calculate the number of artistic activities students participate in, with one point awarded for each activity. Taking an elective course in art will earn five points.
		Artistic activities and performances.	The student actively participates in various artistic activities and creates and expresses beauty in various ways.	D2. The student also learns and masters at least one artistic skill, especially in inheriting outstanding traditional Chinese culture (50%).	Calculation of points for students' school honours (1 point), district-level honours (2 points), city-level honours (3 points), provincial-level honours (4 points), national-level honours (5 points), and world-level honours (6 points).
Labour (25%)	Social practice activity.		Participation in social practice activities, performance, results, etc.	E1. Participation in the actual situation of schools and communities (50%).	Calculate the score for students' participation in social practice activities, with one point awarded for each activity.
	Family Activity.		The number, performance, and evaluation of domestic labour.	E2. The number of times household chores (50%).	Calculate the number of times the student participates in family activities, with one point awarded for each activity.

evaluation, which predicts students' interests, learning style, and professional development and search for suitable ways to support students' learning and development through personalised education (Luyu, Xiabiao, & Yunlin, 2021). The quantitative and qualitative diversified evaluation brings students more visual information. Based on the results of big data analysis, the cold and insensitive data is transformed into educational resources with temperature, driving the deep integration of students' morality, intelligence, physique, beauty, and labour and promoting students' development.

### **7.1 Technology Empowerment, Analysis of Big Data, Evaluation, and Prediction**

In the stage of primary education, students begin to form a worldview, life stance, and personal values. A construct prediction model includes an academic prediction model, psychological development prediction model, career planning model. Big data prediction technology can be used to clean and process behavioural data (course content, interactive communication, daily homework, exam scores, aesthetic taste, psychological characteristics, labour character, etc.), to analyse and judge individual parts, to formulate a path suitable for their growth and development, to monitor the process and to judge the status of students (Tiebo, 2019). It also Predicts students' potential interests, scientifically guides students' learning and development direction, provides reasonable suggestions and makes personalised goals. The student evaluation oriented by the integration of five education is a crucial link to deepening the reform of the education system and improving the mechanism of moral cultivation and education. The big data of student learning and development as evidence can promote students' overall growth and personalised product.

## **8. CONCLUSIONS**

This paper proposes a diversified student evaluation system based on big data technology to realise the integrated development of students' five education. The evaluation subjects include self-evaluation, peer evaluation, teacher evaluation, family evaluation, and others. Therefore, this article explores an innovative integrated student assessment system based on education informatisation compared to traditional student assessments. The system improves the overall precision of student performance, strengthens process monitoring, and explores value-added teaching. It allocates the proportion of different evaluation subjects using a data-driven approach and adjusts the teaching cycle by combining quantitative and qualitative effect analysis. The system has been successfully implemented to assign targeted homework and facilitate differential classroom teaching and learning. In the future, it could also be used to forecast students' learning trajectories. The system uses blockchain technology with hard-to-tamper and traceability features to the forecast model. Big data prediction models process student behaviour data and analyse learning characteristics, suggesting suitable growth, learning, and career development paths for students.

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