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ORIGINAL

AN EVALUATION METHOD FOR THE EFFECTIVENESS OF PHYSICAL EDUCATION

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ABSTRACT

The fundamental focus of national spiritual civilization creation has been the effects of college physical instruction. The contemporary teaching methods exhibit greater flexibility, leading to a lack of reasonable assessment of physical education quality. To tackle this issue, we suggest implementing a technique that utilizes a recurrent neural network (RNN) to assess the standard of IPE. Additionally, we want to develop an automated assessment system specifically designed for this purpose. We gathered a dataset (Student satisfaction, course size, classroom feedback, teacher efficacy and course research). The study employs Min-Max normalization to eliminate redundant elements and ensure uniformity and principal component analysis (PCA) is used to discover relevant properties using already processed data. We simulate trials with Python 3.11 software to assess the efficiency of the suggested algorithm. A simulation environment was constructed to test the proposed approach, yielding notable performance metrics, Accuracy (95.68%), Precision (94.52%), Recall (86.59%) and F1-Score (88.56%). Comparative analysis demonstrates the efficacy of the suggested strategy, addressing limitations related to data availability and network complexities. Future efforts seek to improve RNN structures for various instructional materials, increase the clarity of assessments for better understanding and utilize large statistics to strengthen the model's resilience, resulting in a comprehensive manner supported by evidence based acceptance of the impact of IPE.

KEYWORDS: physical Education (IPE); teaching quality; education; Recurrent Neural Network (RNN)

1. INTRODUCTION

The assessment of the efficacy of physical education (PE) holds great significance in modern society, as the dissemination of values, beliefs and political ideologies influences the cognition and behavior of individuals (Luo, 2022; Tao & Lv, 2022). The implementation of IPE is a varied and intricate undertaking that occurs in diverse settings such as schools, workplaces and communities. Its primary objectives are to inculcate specific beliefs, cultivate critical thinking skills and shape societal conduct (Fu & Xu; Khalili & Orchard, 2020; Martin et al., 2022). An evaluation of programs holds significant importance due to multiple factors. First and foremost, this enables educational institutions, organizations and governments to assess the effectiveness of their programs, ensuring that the desired IPE objectives are achieved (Feng & Dong, 2022). It aids in the identification of areas for improvement, thereby boosting the overall quality of education(ÇIÇEK, EAGDERI, & SUNGUR, 2019). The evaluation of IPE serves as a mechanism to protect against any potential misapplication or manipulation of these initiatives, guaranteeing their alignment with democratic values, upholding the rights of individuals and fostering the development of well-informed citizens (Du, Sun, & Zhao, 2023; F. Li & Li, 2023).

1.1 The Importance of physical Education

IPE involves the spreading of political information, the development of analytical thinking and the encouragement of civic virtues. The aim of this initiative encompass promoting civic engagement and facilitating active involvement in democratic processes through disseminating knowledge and building a sense of citizenship (Norman, 2022; Zhu, Liu, & Seong, 2023). An organized and comprehensive physical education program is crucial for fostering the growth of accountable and socially aware individuals.

1.2 Scope of the Study

This project offers educators, policymakers and academics a valuable tool for enhancing physical education. It will provide practical knowledge on how to create, execute and evaluate these programs to ensure their continued relevance and effectiveness in an evolving world. The present work aims to develop a complete evaluation methodology for analyzing the efficacy of IPE. Through analyzing several factors, encompassing cognitive, affective and behavioral consequences, this approach seeks to provide a comprehensive influence of IPE on people and the broader society. This study suggested a novel approach, Recurrent Neural Networks for evaluation methods for the effectiveness of IPE.

1.3 Key contributions

The following are the main contributions of this study on the assessment methodology for the efficacy of physical education. We gathered a dataset (student satisfaction, course size, classroom feedback, teacher efficacy, course research). Min-Max normalization is used to eliminate redundant elements and ensure uniformity. Principal component analysis (PCA) is used to discover relevant properties using processed data. Furthermore, the Recurrent Neural Network (RNN) is employed as a novel approach to assess the effectiveness of physical education. We evaluate the experimental outcomes in terms of accuracy, precision, recall and F1-score. This study comprises five sections. The pertinent literature is examined in section 2, elucidating its correlation with the investigation. Detailed information regarding the study methodologies, including the strategy and tactics employed can be found in section 3. Section 4 provides a comprehensive and detailed account of the investigations conducted, focusing on the primary conclusions and findings. The final section, section 5, provides a concise overview of the key results and outcomes of the study. This knowledge organization enables the survey of pertinent works, methodology, findings and conclusions, providing readers with a comprehensive understanding of the research.

2. Related work

Study (Rong & Gang, 2021) demonstrated the scientific and successful nature of the established complete assessment model of fuzzy neural network for students' IPE. The proposed model presented in the study incorporated many cognitive processes, including education, organization, acceptance, adaptable mechanisms and fuzzy. The model addresses the limitations associated with each of these processes. Therefore, an illustrative evaluation was conducted using a neighboring institution as a case study. The outcomes of the assessment demonstrated that the model for assessing students' ideological education, as defined in the study, aligns well with past evaluation findings. The study (Zhang, Lu, Zhu, & Zhang, 2023) presented a proposed development trajectory for college IPE in the era of AI. It suggested that educational institutions and instructors should focus on enhancing the transformation of old education methods and establishing contemporary Internet-based education systems. It represented an opportunity for interdisciplinary research, broadened the horizons of research to some extent and offered a point of reference for frontline teaching. The present study (Yun, Ravi, & Jumani, 2023) introduced a novel platform for ideological political instruction called the "Deep Learning-Based IPE" Platform. The platform addressed the existing constraints on global corporations' ability to access finance and trading opportunities, with the ultimate goal of enhancing the quality of education provision. The implementation of ideological education techniques by firms involves the utilization of economic links to solve domestic issues. The effectiveness of educational activities and instruction was enhanced according to the experimental findings. Study (Xiaoyang, Junzhi, Jingyuan, & Xiuxia, 2021) focused on modifying the curricular framework for IPE courses within higher education institutions. The system employed connection rules derived through data gathering and AI techniques to investigate the correlation between software items and vocational categories in the computer sector. The study analyzed the present obstacles in implementing and enhancing Inter Professional Education (IPE) in greater education institutions.

The study (Rui, 2022) conducted an analysis of the existing assessment methods employed in IAP education. The objective was to highlight the deficiencies and limitations of these systems, focusing on issues related to accessibility, openness, the absence of a well-defined evaluation framework and inadequate supervision. They published the results in the form of a scientific study. The novel methodology ensures the outcomes' transparency and openness, leading to a more precise assessment of the evaluation system. Based on the findings and analysis of the experiments and evaluations conducted, it was advisable for college educators to recognize the significance of large amounts of data.The study conducted an investigation of the evaluation methodologies utilized in the field of IAP education. The study (Qin, Wang, Zhao, Tan, & Luo, 2022) examined the shortcomings and constraints of these systems, with a particular emphasis on concerns about accessibility, transparency, the lack of an established evaluation methodology and insufficient oversight. Based on the empirical findings and careful examination of the conducted experiments and evaluations, it was recommended that college educators acknowledge the paramount importance of handling substantial volumes of data.

The objective of the study (Ding, Zeng, & Ning, 2022) was to implement the “BP neural network” in the IPE system, thereby enhancing the system's ability to provide an extensive and accurate depiction of students' actual conditions. Furthermore, the study provided instructions for the advancement of students' IPE. Implementing this system offers a significant and precise method for assessing the quality of IPE among college students. It addressed the challenges associated with human subjectivity by identifying mistakes and assigning appropriate values to scoring indices in the assessment methodology. The study (Y. Wang, 2021) implemented a three-tier framework to construct a model network framework. Leveraging the attributes of fuzzy assessment, an expert system was utilized for handling data, functioning and administering the model assessment. In addition, a corresponding database was established to facilitate real-time data updates. Furthermore, intending to ascertain the efficacy of the model, the study used simulations to examine its effectiveness. In the study (Cheng, 2022), they developed a framework for evaluating the efficacy of instruction in education. The framework was constructed based on five aspects, the key components include program architecture, instructional personnel, learner deduction, development evaluation and computer construction. By analyzing the structural linkage between the elements involved in the execution of curriculum IPE at a microscopic level, the study indicated the fundamental responsibilities associated with this process. The research findings can serve as an invaluable resource for curriculum teaching improvements and the assessment of instructional quantity.Study (M. Li, 2022) presented a novel Apriori enhancement methodology for extracting statistical insights from college-level political science courses. Identifying key factors influencing the efficacy of professors' instruction was accomplished using a sequence of operations involving data collection and preparation. These processes serve to aid educators in enhancing and elevating their teaching proficiency while establishing a robust basis for reforming schooling and administration.

The study (Zhong, 2021) proposed the utilization of “Artificial Intelligence-based physical Learning (AI-IPL)” as an approach to assess the IPE development of students, with a focus on measuring their psychological qualities. The AI-IPL methodology was employed to foster college students' intellectual and political growth, promoting their cognitive and physical well-being. The AI-IPL methodology generates divergent viewpoints among certain pupils, hence shaping the IPL approach and its ultimate inclination regarding creative strategies and psychological educational methods. Study (Zhou & Yang, 2021) proposed using modern technology, namely data mining, to extract counseling knowledge from political and ideological instruction.

The aim was to employ online thought to enhance the effectiveness of IPE activity in educational institutions. Implementing instructional informatization has led to the gradual integration of information technology into educational management practices. In comparison to conventional methods of educational management, there has been a notable enhancement in efficiency and effectiveness. In a study (Mingchao, 2019), the relationship between executive performance management and IPE was examined and evaluated the present condition of administrative achievement leadership in applied higher educational institutions. The objective was to address the existing challenges in evaluating administrative performance in higher educational institutions. An additional performance management system enhances the efficient distribution of organizational assets within utilized institutions and facilitates the achievement of key goals related to the long-term growth of such institutions. The present study (Tian, 2022) introduced a novel strategy called “supervised learning-based teaching evaluation approach (SL-TEA)”, which utilized supervised learning techniques in the context of machine learning technology and the current state of Inter professional Education (IPE).

The approach was designed to be implemented through a concise analytic procedure. It employed an expert system to oversee, execute and supervise the evaluation of models while establishing a database for seamless real-time updates. It suggested the SL-TEA model, which addressed the genuine requirements of the system by evaluating the IPE content in colleges and universities. In study (B. Wang, Yu, Sun, Zhang, & Qin, 2023), a proposed evaluation method was used for evaluating the effectiveness of "curricular IPE (CIPE)" in higher education. They introduced a quantitative technique for measuring the CIPE operation, which depends on individual students' attainment of graduation criteria. The system under consideration offers graphical illustrations of learners' and instructors' performance and the impact of the Center for International Programs and Exchanges (CIPE). It assists students in identifying their position in their chosen field of study while enabling educators to enhance their instructional approaches.

3. Methodology

3.1 Teaching Quality Assessment System (TQAS)

We included an educational information-gathering device that serves as the primary data repository for assessing instructional effectiveness education analyses to enhance the TQAS. Principal component analysis is used for feature engineering after "teacher-side, student-side and school-side" instructional data samples have undergone data pretreatment. There is no way to distinguish among the intermediate and ultimate education results when conventional machine learning methods are used in studies investigating the efficiency of educational ability.

These methods are restricted to variations in the available teaching feedback data. This results in a dispersed assessment system for teaching quality, with the greatest influence coming from the teaching effectiveness at the end. We used a recurrent neural network (RNN) to solve this issue. Figure 1 provides a visual representation of the sequential actions conducted, enhancing comprehension of the process.

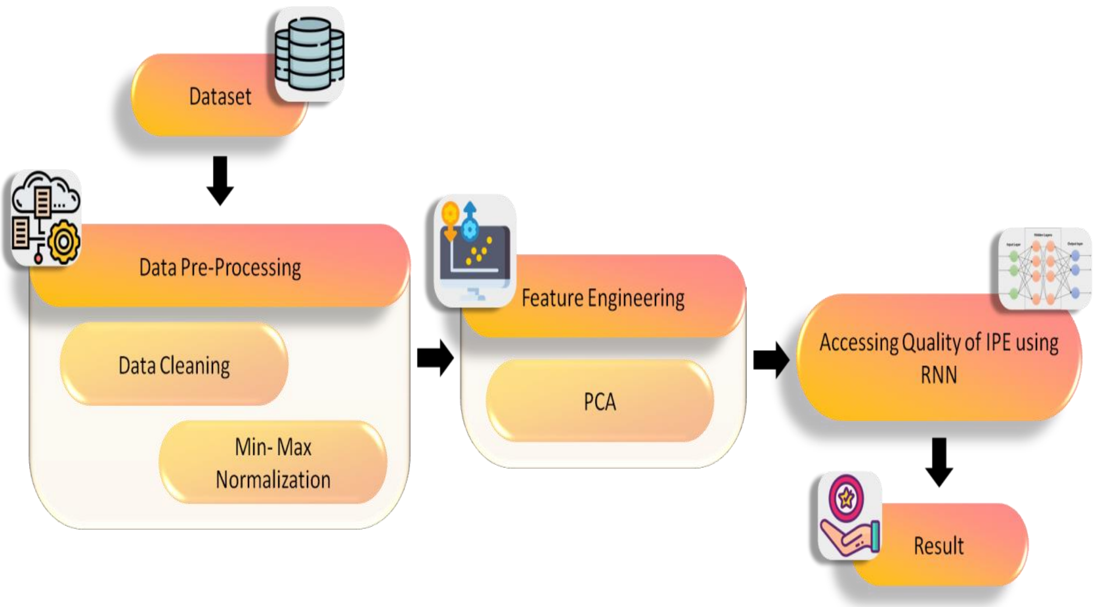

Figure 1: The architecture of teaching quality assessment

3.2 Dataset

In order to verify the effectiveness of the methods for evaluating teaching quality, we created datasets containing input on teaching quality. These datasets encompass three key dimensions: the teacher, the school and the student. To establish a uniform system for evaluating teaching effectiveness, in the original stage, we established five major criteria to evaluate the effectiveness of instruction in creating the dataset, including input on the point of education. These criteria are "teacher effectiveness (TE), student satisfaction (SS), classroom feedback (CF), course research (CR) and course size (CS)". Table 1 illustrates the dataset.

Table 1: Dataset description

FACTOR	DESCRIPTION	TRAIN	TEST	TOTAL
TEACHER EFFICACY (TE)	Variables such as the teacher's expertise in the subject matter, the general structure of the course and the effectiveness regarding the teacher's appearance, taking into account several factors.	2993	1358	4351
STUDENT SATISFACTION (SS)	The level of happiness of learners who choose the education is evaluated based on their experience with both the educational material and its instructor's expertise teaching methods after completing the class.	3651	2630	6281
CLASSROOM FEEDBACK (CF)	Input from students or the school on issues with the subject.	3412	1921	5333
COURSE RESEARCH (CR)	The instructor's comprehension and readiness for the program before its commencement.	2978	1874	4852
COURSE SIZE (CS)	The enrollment figures, which serve as a reliable assessment of the course's attractiveness and efficacy.	3021	1635	4656

3.3 Data preprocessing using min-max normalization

3.3.1 Data cleaning

Data cleaning is essential in preparing datasets, providing precision, entirety and accurate formatting for analysis. Data preprocessing includes the tasks of addressing missing values, eliminating duplicates, rectifying inconsistencies and treating outliers to enhance the quality of data and avoid erroneous outcomes. This procedure comprises identifying missing data items and selecting how to treat them, deleting duplicate entries, standardizing formats, resolving disputes and handling outliers that can damage the study.

Normalizing the data helps ensuring that variables are on the same scale, permitting effective comparison between distinct aspects.

3.3.2 Min-max normalization

Numerical values can be rescaled using the min-max normalization technique to fall into a given range between 0 and 1. Several metrics representing different aspects of the evaluation process can be subjected to min-max normalization in the evaluation method for the effectiveness of IPE.

We have a quantitative metric, X, that stands for a particular component of the assessment process, such as instructor effectiveness or student pleasure. This formula can be used to apply min-max normalization to this measure:

$$X_{norm} = \frac{X - X_{min}}{X_{max-}X_{min}} \quad (1)$$

Where X_{norm} the normalized quantity of the information demonstrates X, $X_{min}$is the attribute's lowest value and $X_{max}$is the feature's highest value. The original values of X will be changed into a normalized range between 0 and 1 by using this formula. This procedure guarantees that no single aspect of the assessment method dominates the study because of variations in their initial scales, allowing for a fair comparison of many characteristics of the way.

3.4 Feature engineering using principal component analysis (PCA)

3.4.1 Principal Component Analysis

The primary concept of PCA was to generate a linear transformation of the original data with distinct correlated features. The modification of the principal components load (PCL) matrices was done to reflect the real knowledge using a group of new data that has fewer attributes.

The method of reducing the density of multivariate input is suitable. Construct the empirical matrix Y using actual data. The vector Y is determined by the x elements $\theta_1, \theta_2, \ldots, \theta_x$after N trials. The value of n in the columns reflects the count of samples that were found, while each row corresponds to a quantitative approximation of the sampling characteristics of the collection as described in Equations (2).

$$Z = \begin{bmatrix} Z_{11} & Z_{12} & \cdots & Z_{1w} \\ Z_{21} & Z_{22} & \cdots & Z_{2w} \\ \vdots & \vdots & \ddots & \vdots \\ Z_{m1} & Z_{m2} & \cdots & Z_{mw} \end{bmatrix} \quad (2)$$

Centralizing the information collection is necessary for monitoring the matrices. Determine the average median using Equation (3).

$$\overline{z_b} = \frac{1}{o}\sum_{a=1}^{o} z_{cd} \quad (3)$$

The equation for standardized deviations. (4),

$$S_c = \sqrt{\frac{1}{o}(z_{cd} - \overline{z_c})^2} \quad (4)$$

Based on Equation (5),

$$\widetilde{z_{cd}} = \frac{z_{cd} - \overline{z_c}}{S_c}(d = 1,2, \dots, o, c = 1,2, \dots, x) \quad (5)$$

By performing centralized data processing based on the equation, create the standardized matrix$\overline{z_a}$, calculate an example correlation matrix Equation (6),

$$W = \frac{1}{p}\tilde{Z}^T\tilde{Z} \quad (6)$$

Every component in W is computed based on Equation (7).

$$w_{cd} = \frac{\sum_{k=1}^{o}(z_{cd} - \overline{z_c})(z_{cd} - \overline{z_c})}{\sqrt{\sum_{k=1}^{n}(z_{cd} - \overline{z_c})(z_{cd} - \overline{z_c})^2 \sum_{k=1}^{n}(z_{cd} - \overline{z_c})(z_{cd} - \overline{z_c})^2}} \quad (7)$$

The eigenvalue and eigenvector of W. Determine the x feature values of W, which are$\lambda_1 \geq \lambda_2 \geq \cdots \geq \lambda_x \dots \geq 0$. Calculating the rate of participation for each primary component using the Equation (8),

$$r_d = \frac{\lambda_d}{\lambda_1 + \lambda_2 \dots + \lambda_x}(d = 1,2, \dots, x) \quad (8)$$

Choose the premier q main component that achieves 90% and yields the PCA outcome of$\lambda_{q=1}$. The corresponding eigenvectors, $h_1, h_2, \dots, h_o$ are computed utilizing the results for the characteristics arranged in a decreasing sequence, $1,2, \dots, w$. For the PCL, choose the top r features Equation (9),

$$L_{x \times p} = (h_1, h_2, \dots, h_o) \quad (9)$$

Using the PCL matrix $L_{x \times p}^T$ and Equation (10), produce new primary variables $s_1, s_2, \dots, s_r$ by gradually changing the actual data,

$$\begin{bmatrix} y_1 \\ \vdots \\ y_o \end{bmatrix} = L_{x \times p}^T \begin{bmatrix} \theta_1 \\ \vdots \\ \theta_o \end{bmatrix} \quad (10)$$

The matrices underwent a linear transformation that resulted in a shift in its properties $between\ x\ to\ p$. This transformation had a major impact on the quantity of obtainable data, reducing it considerably.

3.5 Assessing quality of IPE using RNN

3.5.1 Recurrent neural network

The RNN model consists of three sections: the inputs layers, the hidden layer and the output layer. The classic neural networks machine learning model's architecture is similar. The connectedness of the neuronal networks bridging the hidden layers is the unique characteristic of the RNN model. In addition to the input value x of the input layer, the input of the hidden layer includes the output of the hidden layer from the previous time step. The following describes this relationship.

$$g = e(w + g_{s-1}) \quad (11)$$

The RNN neural network's hidden layers of neurons have a system of feedback that can transfer contextual knowledge, enabling the RNN model to interpret and anticipate sequential samples of data. It is utilized in the creation of soundtracks, machine translation, text classification and visual descriptions as shown in figure 2. Each networking element exhibits a non-linear sigmoidal activation value during all stages of forward information transfer.

$$sigm\ (w) = \frac{1}{1+f^{-w}} \quad (12)$$

The goal of minimizing the operational value with the least amount of error is achieved by adjusting the weights and sensitivities of each neuron in the neural network utilizing the slope descent approach during the downstream error propagation phase. The cost function can be defined as follows:

$$i(x, a : w, z) = \frac{1}{2}\left|\left|g_{x,a}(w) - z\right|\right|^2 \quad (13)$$

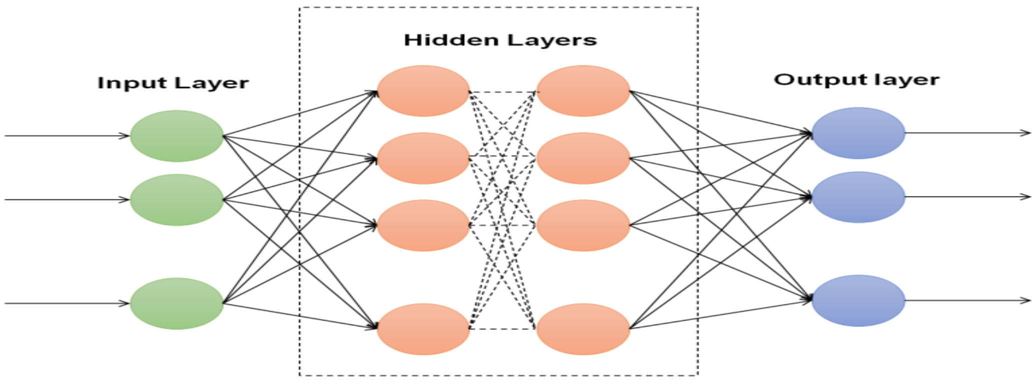

Figure 2: Architecture of RNN

4. Results and discussions

4.1 Experimental setting

To assure the autonomy and reliability of the evaluation system for its quality of IPE, we established a separate mainframe computer for the structure and all the interconnected technologies were constructed on this mainframe processor as the foundation. Our experiments involved configuring the testing area of the Anaconda system. We have set up separate development frameworks on the main machine to accommodate the diverse demands between the classrooms interaction graphical technology with the unique teaching architecture, taking into account their distinct requirements and the desired teaching quality. The Tensor Flow architecture is utilized in the development of the IPE Quality Prediction Neural Network. By leveraging the robust programming network component, we could construct our education value prediction networks. Table 2 displays the specific learning values.

Table 2: Learning values

PARAMETERS	EPOCH	LEARNING RATE	ITERATIONS	DECAY RATE	DROPOUT RATE	MOMENTUM
VALUES	131	0.002	1001	0.002	0.6	0.7

4.2 Evaluation Modeling Test based on RNN

4.2.1The results of the comparison between expertises based scores and model predictions

Table 3 and Figure 3 display the experiment examples that were evaluated by specialists and the RNN model was used to generate predictions and findings. According to the statistics presented in Figure 3, the expertise-based score for the test sample are 87, 82, 80, 90 and 82, respectively. The RNN model predictions values are 85, 80, 77, 92 and 82 in that sequence. The data indicates that the RNN model has improved, with a noticeable narrowing of the measurement error domain.

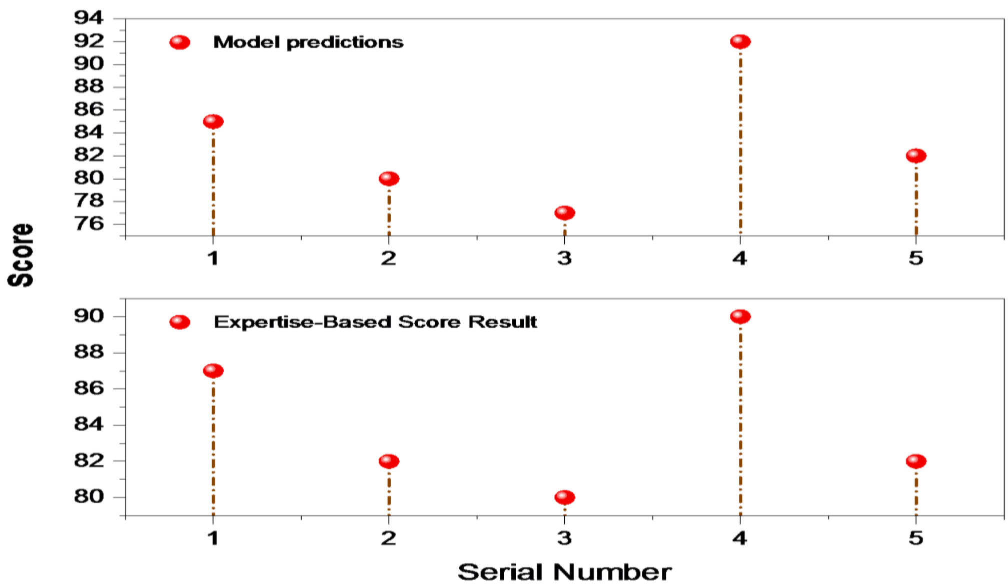

Figure 3: Comparison of model predicts versus expertise based score

Table 3: Comparison of model prediction results with expertise score outcomes

SERIAL NUMBER	SCORE	
	EXPERTISE-BASED SCORE RESULT	MODEL PREDICTIONS
1	87	85
2	82	80
3	80	77
4	90	92
5	82	82

4.3 Examination of Empirical Findings

To assess the efficacy of physical education, it is possible to establish the criteria of accuracy and precision in the following manner: Accuracy refers to the ratio of detected occurrences, encompassing positive and negative cases, to the overall number of instances.

$$Accuracy = \frac{TP + TN}{TP + TN + FP + FN}$$

(14)

Precision is a metric that quantifies the ratio of identified positive cases to the overall number of instances that were classified as positive.

$$Precision = \frac{TP}{TP + FP}$$

(15)

In the framework of assessing the efficacy of IPE, these measurements can facilitate the evaluation of the extent to which students or participants possess accurate comprehension or support specific physical principles.

Equations (14) and (15) evaluate the accuracy and precision of a method in estimating its position using the given information. Figure 4 and Table 4 illustrate the comparative assessment of the current and suggested approach. Our proposed method, RNN achieves an accuracy value of 95.68%, exceeding the existing methods SVM (93.72%), RF (93.6%) and SLDA (92%).

Additionally, our proposed method achieves precision values of 94.52%, outperforming the existing methods such as SVM (87.65%), RF (87.44%) and SLDA (90.66%). These results demonstrate the superiority of our suggested approach in terms of the effectiveness of IPE.

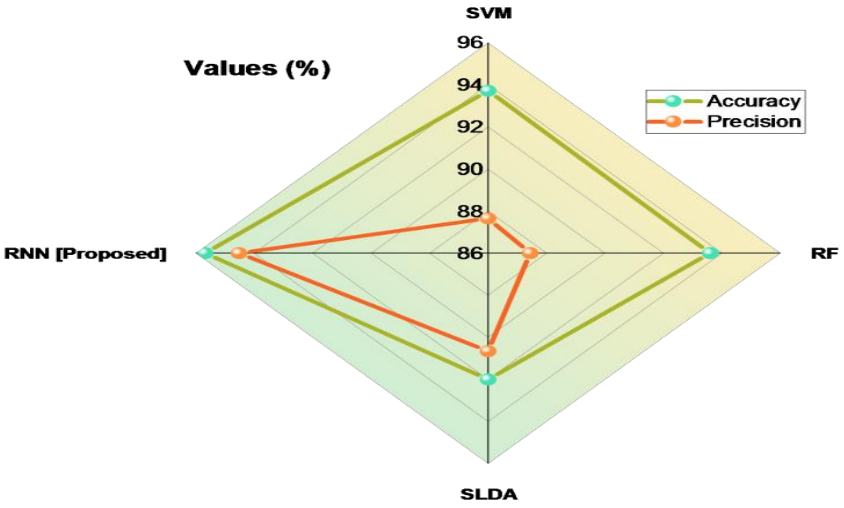

Figure 4: Result of Accuracy and precision

Table 4: Value of Accuracy and precision

METHODS	VALUES	
	ACCURACY	**PRECISION**
SVM (Pan & Yeh, 2023)	93.72	87.65
RF (Pan & Yeh, 2023)	93.6	87.44
SLDA (Pan & Yeh, 2023)	92	90.66
RNN [Proposed]	95.68	94.52

The evaluation methodology for assessing the efficacy of IPE employs the metrics of recall and F1-score. Recall refers to the proportion of recognized positives situations irrespective of the total number of real affirmative examples.

$$Recall = \frac{TP}{TP+FN} \quad (16)$$

The F1-score is a used metric in academic research and evaluation for evaluating performance. The F1-score is a productivity measure that evaluates a model's effectiveness by considering both accuracy and recall. The metric is determined by taking the symmetrical means of precision and recall, thus offering an equitable assessment of the model's efficacy.

$$F1 - score = 2 \times \frac{Precision \times Recall}{Precision + Recall} \quad (17)$$

This approach becomes advantageous in scenarios where the dataset exhibits an imbalance, as it factors into account the occurrence of both false positives and false negatives. In the framework of assessing the efficacy of physical education, the utilization of recall and F1-score aids in comprehending the degree to which physical concepts are communicated. This encompasses the accurate identification of positive instances as well as the delicate balance between precision and recall. Equations (16) and (17) assess the recall and F1-score of a method in determining its position based on the provided data.

Figure 5 and Table 5 depict the comparative evaluation of the existing and proposed methodology. The suggested approach, RNN yields a recall rate of 86.59%, surpassing the recall rates of the existing methods SVM (72.26%), RF (75.52%) and SLDA (68.83%). In addition, our proposed technique attains an F1-score of 88.56%, surpassing the performance of the existing methods SVM (78.08%), RF (80.92%) and SLDA (75.91%). These results indicate the efficiency of our suggested method in terms of the feasibility of IPE.

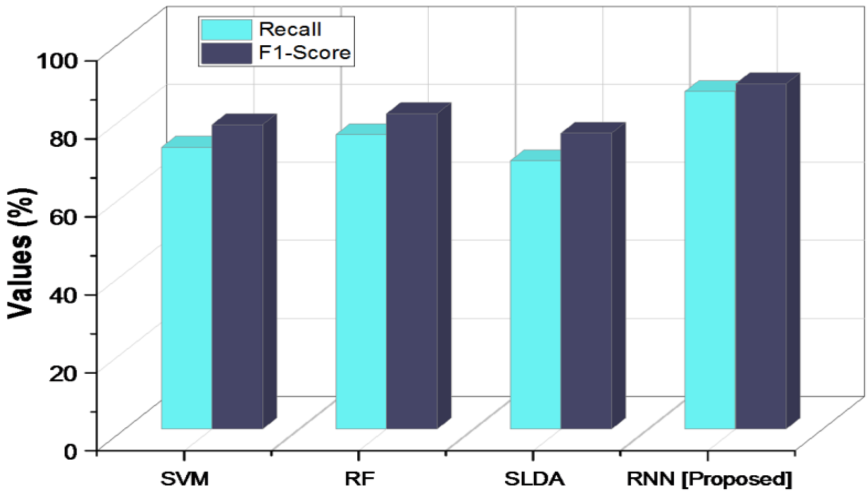

Figure 5: Outcome of Recall and F1-score

Table 5: Outcome value of Recall and F1-score

METHODS	VALUES	
	RECALL	F1-SCORE
SVM (Pan & Yeh, 2023)	72.26	78.08
RF (Pan & Yeh, 2023)	75.52	80.92
SLDA (Pan & Yeh, 2023)	68.83	75.91
RNN [Proposed]	86.59	88.56

5. Discussion

Fuzzy neural networks exhibit computational complexity and a deficiency in interpretability, hence constraining their suitability in specific fields (Rong & Gang, 2021). The limitations of artificial intelligence include its lack of contextual understanding and its propensity for bias and discriminatory tendencies in decision-making (Zhang et al., 2023). The BP neural network exhibits a limited capacity to process complicated, high-dimensional data that is prone to overfitting, as stated in reference (Ding et al., 2022). The deployment of AI-IPL has the ability to perpetuate pre-existing biases and exacerbate the division of opinions as a result of inherent data biases and the creation of echo chambers (Crawford, Lancaster, Oh, & Rychtář, 2015). This has the potential to undermine the principles of diversity and critical thinking. Furthermore, there are ethical considerations that emerge in relation to privacy, manipulation and control in the context of AI-driven political learning (Zhong, 2021). The utilization of supervised learning-based teaching evaluation (SL-TEA) is constrained by its dependence on labeled data for training and the possibility of bias in the accuracy of these labels (Tian, 2022). The promotion of critical thinking and the restriction of CIPE (Civic and Intercultural Education Program) to non-partisan and fact-based debate have been advocated (B. Wang et al., 2023).

6. Conclusion

A robust evaluation technique for physical education should encompass comprehensive assessment criteria, such as changes in behavior, the cultivation of critical thinking skills and active participation in society to measure its effects. Recurrent neural networks (RNN), a unique method that integrates an assessment method for political and ideological education, are introduced in this study. We gathered a dataset (Student satisfaction, course size, classroom feedback, teacher efficacy and course research). The research employs Min-Max normalization to eliminate redundant elements and ensure uniformity and principal component analysis (PCA) is used to discover relevant properties using processed data. In MATLAB, the team created a simulation environment to test the effectiveness of the suggested approach. The results obtained for Accuracy (95.68%), Precision (94.52%), Recall (86.59%) and F1-Score (88.56%) show that the suggested strategy performs effectively. The suggested approach improves the present strategy, according to an analysis between each of the approaches. Recurrent neural networks (RNNs) evaluation methods for physical education encounter difficulties in obtaining labeled data and comprehending complex network outputs, which can introduce biases. Future work will focus on improving RNN architectures for a variety of educational content, incorporating interpretability approaches for transparency and utilizing large datasets to increase the robustness of the model and develop a nuanced and data-driven understanding of the impact of education.

REFERENCES

Cheng, P. (2022). Evaluation Method of Ideological and Political Classroom Teaching Quality Based on Analytic Hierarchy Process. *Scientific Programming, 2022*.

ÇIÇEK, E., EAGDERI, S., & SUNGUR, S. (2019). Oxynoemacheilus phoxinoides (Erk'akan, Nalbant & Özeren, 2007): a junior synonym of Oxynoemacheilus angorae (Steindachner, 1897). *FishTaxa, 4*(1), 13-17.

Crawford, K., Lancaster, A., Oh, H., & Rychtář, J. (2015). A voluntary use of insecticide-treated cattle can eliminate African sleeping sickness. *Letters* *in Biomathematics, 2*(1), 91-101. doi:https://doi.org/10.30707/LiB2.1Crawford

Ding, Y., Zeng, W., & Ning, Z. (2022). Quality evaluation of ideological and political education in universities based on BP neural network. *Computational intelligence and neuroscience, 2022*.

Du, G., Sun, Y., & Zhao, Y. (2023). The Innovation of Ideological and Political Education Integrating Artificial Intelligence Big Data with the Support of Wireless Network. *Applied Artificial Intelligence, 37*(1), 2219943.

Feng, L., & Dong, Y. (2022). Teaching Quality Analysis of College Ideological and Political Education Based on Deep Learning. *Journal of Interconnection Networks, 22*(Supp05), 2147006.

Fu, Z., & Xu, W. The Ideological and Political Education of College Counselor Driven by and Its Effect Analysis.

Khalili, H., & Orchard, C. (2020). The effects of an IPS-based IPE program on interprofessional socialization and dual identity development. *Journal of interprofessional care*, 1-11.

Li, F., & Li, J. (2023). The Subject Accessibility of Ideological and Political Courses for Electrical and Electronic Majors. *International Journal of Computational Intelligence Systems, 16*(1), 45.

Li, M. (2022). A Data Mining-Based Method for Quality Assessment of Ideological and Political Education in Universities. *Mobile Information Systems, 2022*.

Luo, D. (2022). Research on the implementation path of ideological and political education in private colleges and universities under the network environment. *Journal of Environmental and Public Health, 2022*.

Martin, P., Hill, A., Ford, M., Barnett, T., Graham, N., & Argus, G. (2022). A novel interprofessional education and supervision student placement model: Student and clinical educator perspectives and experiences. *International journal of environmental research and public health, 19*(17), 10734.

Mingchao, L. (2019). *Research on the Performance Improvement of Administrative Management in Applied Universities from the Perspective of Ideological and Political Education.* Paper presented at the International Conference on Reform, Technology, Psychology in Education. Recovered fro m https://webofproceedings. org/proceedings_series/ESSP/ICRTPE.

Norman, J. M. (2022). Other people's terrorism: ideology and the perceived legitimacy of political violence. *Perspectives on Politics*, 1-18.

Pan, C., & Yeh, J.-L. (2023). The Analysis of Integration of Ideological and Political Education and Mental Health Education for College Students. *Eurasian Journal of Educational Research, 104*(104), 33-53.

Qin, J., Wang, Y., Zhao, Q., Tan, L., & Luo, Y. (2022). Evaluation of college students' ideological and political education management based on wireless network and artificial intelligence with big data technology.

Security and Communication Networks, 2022, 1-9.

Rong, Z., & Gang, Z. (2021). An artificial intelligence data mining technology based evaluation model of education on political and ideological strategy of students. *Journal of Intelligent & Fuzzy Systems, 40*(2), 3669-3680.

Rui, Z. (2022). Research on evaluation system of ideological and political education of college students based on decision system. *Soft Computing, 26*(20), 10805-10812.

Tao, T., & Lv, X. (2022). Construction of ideological and political education in colleges and universities based on the carrier of smartphone. *Security and Communication Networks, 2022*, 1-8.

Tian, Y. (2022). Teaching effect evaluation system of ideological and political teaching based on supervised learning. *Journal of Interconnection Networks, 22*(Supp05), 2147015.

Wang, B., Yu, H., Sun, Y., Zhang, Z., & Qin, X. (2023). An Effect Assessment System for Curriculum Ideology and Politics based on Students' Achievements in Chinese Engineering Education. *International Journal of Advanced Computer Science and Applications, 14*(1).

Wang, Y. (2021). Ideological and political teaching model using fuzzy analytic hierarchy process based on machine learning and artificial intelligence. *Journal of Intelligent & Fuzzy Systems, 40*(2), 3571-3583.

Xiaoyang, H., Junzhi, Z., Jingyuan, F., & Xiuxia, Z. (2021). Effectiveness of ideological and political education reform in universities based on data mining artificial intelligence technology. *Journal of Intelligent & Fuzzy Systems, 40*(2), 3743-3754.

Yun, G., Ravi, R. V., & Jumani, A. K. (2023). Analysis of the teaching quality on deep learning-based innovative ideological political education platform. *Progress in Artificial Intelligence, 12*(2), 175-186.

Zhang, T., Lu, X., Zhu, X., & Zhang, J. (2023). The contributions of AI in the development of ideological and political perspectives in education. *Heliyon, 9*(3).

Zhong, J. (2021). Exploring and researching ideological and political education of college students' psychological quality for the development of artificial intelligence. *Mobile Information Systems, 2021*, 1-12.

Zhou, W., & Yang, T. (2021). *Application analysis of data mining technology in ideological and political education management.* Paper presented at the Journal of Physics: Conference Series.

Zhu, W., Liu, X., & Seong, D. (2023). Educational Innovation in Higher Education: Role of Innovative Competencies, Learning Environment, Student Readiness and Ideological and Political Education. *Educational Administration: Theory and Practice, 29*(1), 178-197.