Music Inheritance and Innovation in Vocal Music Education Practice: An Exploration from an Interdisciplinary Perspective

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Abstract: Music education in colleges and universities is pivotal in nurturing creativity and holistic development among students. However, traditional approaches to vocal music education can partially align with the evolving needs of a globalized and culturally diverse society. The study employs a novel teaching and learning methodology known as Genetic-adaptive Teaching-Learning-Based Optimization (GA-TLBO) to develop a customized curriculum that adapts to the diverse needs and backgrounds of students. GA-TLBO utilizes genetic algorithms to optimize the teaching process, ensuring a tailored and adaptive educational experience. Through numerical simulations of the standard test set (J120 and J30) and a comparative analysis with the established GA-TLBO algorithm, the findings indicate that 92% of the solutions in the Elite Teaching-Learning-Based Optimization (ETLBO) outperform that are not surpassed by the methods in the keys without dominance set of GA-TLBO. Conversely, two percentages of the practices in the solutions without dominance set of the optimized ETLBO are outperformed by the solutions without dominance of the original GA-TLBO algorithm. The approach fosters cross-cultural understanding and artistic expression while accommodating the unique characteristics and aptitudes of individual learners. Fostering a diversified and adaptable learning environment besides enhances students' musical abilities but also promotes cultural exchange, creativity and innovation, preparing them to excel in a globalized and competitive world.

Keywords: Vocal Music, Innovation, Inheritance, Genetic-Adaptive Teaching-Learning-Based Optimization (GA-TLBO).

1. INTRODUCTION

An essential tool for conserving and expanding musical traditions while accepting innovation was vocal music instruction, which was a necessary component of music pedagogy (Gaunt et al., 2021). They adopted an interdisciplinary approach to explore the numerous features that underpin the art of vocal music instruction, were focused on the lively relationship between musical inheritance and creativity in the educational sector (Haidan & Banchongsilpa, 2023).

1.1 The Function of Inheritance in Music

Vocal music education's musical heritage must be passed on to future generations for great traditions to endure. They required cultivating a profound respect for the classic craftsmanship of vocal music. Educating students about the classical works, vocal techniques and interpretive subtleties that make up the legacy of vocal music was part of the practice of music inheritance. It was about appreciating the melodies that have resounded across history and taking lessons from the past (Sun & Karin, 2022).

1.2 The Innovative Reimagining of Education

The ability to challenge accepted standards and venture into uncharted territory was a requirement for innovation in vocal music instruction. They explored the fascinating possibilities that can be realized via the imaginative reworking of teaching.

To make the learning process more attractive, approachable and pertinent for students, vocal music educators are urged to experiment and adapt. Innovation in musical education goes beyond the subject matter taught; it includes the techniques, tools and instructional strategies used to develop young musicians (Hess, 2019a).

1.3 Multiple Fields Connecting at a Point

By incorporating ideas from other areas, interdisciplinary enhances the vocal musical instruction environment. Vocal music education can be improved, enlarged and situated in ways that appeal to contemporary learners by drawing on various fields (Schiavio et al., 2021), including psychology, neurology and technology. Integrating multidisciplinary knowledge advances our understanding of music's tremendous influence on the human experience to a more comprehensive and nuanced level.

1.4 Combining the Traditional with the Modern

Every creative form, including music instruction, benefits from an appropriate equilibrium between tradition and contemporary. To allow students to communicate with themselves via their musical talent, the part emphasizes how important it was to respect old techniques while embracing current ideas (Zhou, 2022). Education in vocal music serves as a link between time-honored classical works and evolving modern creations.

1.5 Developing Personal Talents

Vocal music instruction ought to be a tailored experience where students' unique abilities and aspirations are fostered. The need to modify the educational process to consider each student's talents and preferences was examined (Varvarigou, 2019). It underlines how crucial it is for teachers to recognize and support their students' musical talents so that they can grow and realize their full voice potential.

1.6 Utilizing Technology to Improve Learning

Technology developments open up new possibilities for improving vocal music teaching. They used online resources and platforms to supplement conventional pedagogical approaches. The use of technology in music instruction in modern times adds an exciting new dimension, from virtual voice exercises to collaborative music theory apps (Waddell & Williamon, 2019).

1.7 Navigating the Complex Issues in Vocal Education

There are several difficulties in vocal teaching, from the mechanical to the creative. The ability to express emotion and interpret sounds through vocal expression, the requirement of sight-reading and music theory comprehension, the continuous search for excellence in diction, pronunciation and the acquisition of proper vocal techniques are some of these challenges (Hess, 2019b). Vocal education was a delicate fusion of art and science because students struggled to balance sticking to the composer's meaning and their interpretation (Toscher, 2020). These difficulties highlight the complex nature of voice instruction, which calls for an all-encompassing strategy that fosters both technical proficiency and artistic sensibility. Many people realize how important music education is for students' holistic development and creativity. There were colleges and universities that are investigating the creative route of broadened vocal music education reform under the cutting-edge educational theories of both China and the West. Reevaluating conventional methods of vocal music instruction and embracing a more flexible and inclusive framework that considers the complexity of today's global society was imperative as multidisciplinary learning and the combination of diverse cultural viewpoints become more and more critical.

1.8 Contributions of the study

By promoting cultural interaction, customized learning and preparing

students for global competitiveness, the study enhances music education in colleges and universities. It pioneered the GA-TLBO technique.

➢ The GA-TLBO technique was a novel approach to individualized vocal music instruction in post secondary educational settings. It supports a customized and adaptable learning experience by utilizing genetic algorithms, meeting the various demands and backgrounds of students.

➢ With 92% of the solutions performing better than the conventional GA-TLBO algorithm, the study's results reveal that the ETLBO strategy produces superior outcomes. They demonstrate how the new approach has improved students' musical aptitude and learning outcomes.

➢ The strategy promotes artistic expression and cross-cultural understanding, enabling a varied and inclusive learning environment. They promoted cultural exchange by enriching students' learning experiences and preparing them to face the difficulties of a connected and globalized world.

➢ The research focuses a strong emphasis on encouraging innovation and originality in music education, giving students the tools they need to succeed in a cutthroat, global environment. The strategy encourages students to become rounded people who can thrive in various professional situations by fostering holistic development and promoting creativity. The article was divided into various crucial sections, including section 2, which examines related writings on vocal music, investigating the body of knowledge already available. The techniques and resources used in the environment of vocal music instruction are described in section 3. The study's findings are presented in section 4, along with a thorough analysis. The investigation was concluded in section 5, which summarizes significant conclusions and suggests possible future research topics.

2. RELATED WORKS

The essential elements of aspiring music art instructors' education were examined in the article (Boichenko et al., 2020), which spans the fields of historical music, theoretical music and performing music. They highlight the pedagogical potential of interdisciplinary collaboration and provide strategies for placing the system into practice. They offered perceptions into how multidisciplinary collaboration might improve the whole training process, enabling aspiring music art instructors to autonomously adapt and imaginatively engage in didactic, pedagogical and performance activities. In this method, expressiveness, technical difficulties, the discrepancy between

ideal auditory-figurative notions and actual sound were examined. The study (Mu & Liu, 2023) evaluated the effects of the Orff approach to instruction on preschool kids' musical interests and cultural knowledge in Hebei province. Questionnaire results from research including 20 preschool settings demonstrated that the Orff technique had a favorable impact on children's interests, academic achievement and classroom climate. The method improved the students' all-around musical skills and fit well with the traits of preschool education majors. The study's shortcomings include geographical specificity and breadth. It establishes a basis for developing qualified kindergarten instructors. The purpose of the article (Y. Zhao, 2023) was to emphasize the value of aesthetic education as crucial for developing people's aesthetic personalities. They were especially true with fundamental music instruction and they highlight the necessity of placing aesthetics alongside information since doing so encourages moral reflection as well as advances the search for a better existence. The findings show that primary music education should adopt a more loving approach using interdisciplinary expertise and music technology to encourage "beautiful hearts" and "intelligent minds." While it emphasizes the long-term value of fundamental music education in developing artistic individuality, some of its drawbacks can include difficulties in implementing the strategy into practice. Since numerous organizations continue to depend on 19th-century Western musicology, the goal of the study (Li, 2023) was to accomplish the requirement that China's music education adapt to a post-industrial, varied setting. To build a music educational system aligned with the spirit of the modern period within the framework of local and worldwide cultural contacts. Analyzing the potential and difficulties that diversity presents was part of the process. As a result, it was critical to adapt the music educational system to the post-industrialization of the economy and culture. The study's shortcomings can include the difficulties in executing such a change into practice, but it does indicate that adjusting to the conditions was necessary. The study's (Wu & Woramitmaitree, 2023) objective was to present a comprehensive analysis of the Chinese National Symphony at the nation's Sichuan Academy of Music, highlighting its background, repertoire, standing and contributions to advancing Chinese ethnic music along with musical reform. The results underscore the orchestra's relevance in China's harmonious environment by combining qualitative research methods such as interviews and fieldwork with document analysis. The article's results show that the instruments were a significant component of the orchestra's growth of Chinese folk music and played a crucial function in its capacity. One of the

downsides was the potential for problems retaining its impact over time. To address the uneven social involvement in music instruction in Spain, the research (Lorenzo de Reizabal, 2022) proposed the idea of a music mediator model to promote social well-being and cohesiveness. It examined conventional educational paradigms, analyzed the demand for modernized teacher preparation and specialized knowledge in socio-community learning, yet emphasized the significance of creating instructional methods and teaching techniques to complement the music mediating model. Its capacity to adapt to changing situations has the potential to be a drawback. Categorizing updated music instructional models including the new music interaction model remains a critical achievement. The study's (Zhang, 2023) goal was to propose novel reforms in ethnic music instruction in higher education institutions, particularly concerning the setting of artistic activity. It applies information fusion technology while analyzing and identifying music signals using the Kalman filter technique. Compared to previous approaches, the experimental findings show an improved identification time and an accurate recognition rate of 96.57%. With 73.47% of students endorsing it, the strategy was quite successful with them. The study's findings show that information fusion technology can be a valuable instrument for fostering art practice creativity in university-level ethnomusicology instruction. The study (Zhang et al., 2023) was to discuss how students' perceptions of Chinese traditional music have changed as a result of the Western culture of music lessons in Chinese institutions. They used a critical assessment of the current music education system to identify its drawbacks and effects while underscoring the significance of incorporating traditional musical culture into the classroom. A new teaching management style and set of curricular standards were suggested in the study, with the larger objective of preserving and passing along traditional music culture. The difficulty of making these modifications in the current system might be a restriction. With an emphasis on cultural relevance, the study (X. Zhao, 2023) intended to address the difficulties in incorporating old Chinese literary art songs into voice instruction in colleges and universities. Through analysis, it determines problems, including students' misunderstandings, murky teaching goals and a need for instructional materials. The suggested remedies include boosting faculty training, instructional clarity and students' perceptions of worth. The strategy desires to support kids' cultural and vocal growth. One of the limitations was how these concepts might be used in actual educational institutions that already exist. The study (Liu & Wu, 2023) comprising 366 festival performers, seeks to understand

how music instruction, music art education and cultural inheritance interact in Nanyin performance. They showed a strong correlation between Nanyin performance and music education, regulated by cultural heritage and mediated through musical art learning. They added a fresh model to the body of knowledge on music education. Its focus was solely on Nanyin and music instruction. It introduces the dynamics of mediation and moderation theoretically. In terms of practice, it informs the improvement of Nanyin's performance. The study (Yu & Zou, 2023) investigated the creative application of blockchain-based systems in AI-enhanced music education and training. They explored the fundamentals and features of blockchain technology while showcasing its potential for future advancement. They emphasized the significance of requirement analysis as the cornerstone for network development and execution, particularly in its setting of block chain-based, fabric architecture-based digital education resource management. They showed that using blockchain to improve educational resource management was feasible and advantageous. The difficulties of widespread acceptance and integration in current educational institutions can have some drawbacks. The research (Shi, 2021) investigated how digitalization has affected the transmission and preservation of traditional Chinese music in the Internet era. They suggested techniques for utilizing digital technologies to show and transmit the cultural legacy and the analysis emphasizes the importance of digitalization in bringing traditional music back to life. They highlighted how digital technology can help preserve and promote traditional music. There are some drawbacks, such as the difficulty of verifying validity and availability in the digital space. The article (Wang, 2022) investigated how artificial intelligence (AI) can be used in music education and in vocal instruction for music majors. They demonstrated the ways that AI can transform conventional music education by delivering individualized instruction and monitoring student development. Based on the questionnaire, students preferred computer-based learning, demonstrating the potency of AI-based systems. They underscored the need for speech-education technologies powered by AI designed for music classes. Limitations might include the requirement for specialized AI expertise and potential issues ensuring the legitimacy of musical instruction in a digital environment. The study (Tang, 2022) was to address the issue of incorporating China's rich ancestral musical tradition into college vocal music education, which was becoming increasingly influenced by Western musical culture. They discover efficient tactics for its integration, focusing on protecting and advancing traditional music culture. The process entails

a thorough investigation of instructional strategies. The study's findings highlight the value of including traditional music cultures in voice teaching to broaden students' musical literacy. The restrictions might be brought about by potential opposition to change within current educational systems. The transformational potential of big data in music research was shown in the article (He, 2020), which examined the interface between the technology of big data and clarinet performance. Big data's importance was discussed concerning the expressive capabilities of the clarinet as well as its more significant effects on the transmission, invention and growth of world music culture. They shed information on how music research will develop in the future and whether it will integrate with new technology. Limitations can include difficulties with data security and issues with study ethics. The study (Fu, 2020) said that vocal music instruction must improve to reflect contemporary educational principles and student-centered teaching methods. Rebuilding the teaching model and focusing on cutting-edge techniques was necessary to raise the caliber and standard of vocal music education as well as, in the age of technological breakthroughs, promote holistic student development. To maximize the study (Xu) of vocal music education, teachers need to use creative teaching techniques and broaden the curriculum to accommodate the different developmental demands of their pupils. Colleges and universities can enhance the educational experience by implementing innovative teaching methods, supporting creative development and adapting to changing national trends in vocal music, even if maintaining various instructional activities can present some difficulties. The study (Liu, 2019) found that, given the multidisciplinary and cultural richness of collegiate vocal music, including pluralistic culture into the curriculum was essential in an era where complete education was prioritized. While mentioning possible implementation obstacles, they seek to assess the necessary and successful integration strategies that align with contemporary commercial education. The effect of online media on vocal musical instruction in Chinese institutions calls for creative solutions in the era of digital innovations. The study (Jiang, 2020) was to improve students' vocal music abilities and artistic quality while identifying potential implementation challenges. It does this by utilizing technology for networks, diversifying content, modernizing teaching methods, encouraging practical experiences and developing a comprehensive curriculum database. The research (Hua & Cheng-Kang, 2023) envisioned a reinvigorated strategy that meets the diverse training demands of modern music talents by incorporating operas into vocal music instruction. They foresee a dynamic transformation by

examining the use of musicals in different Chinese institutions and highlighting their influence on vocal music education. It recognizes potential implementation and sustainability challenges and emphasizes the significance of continuous development.

3. MATERIALS AND METHODS

To improve teaching and learning in vocal music education, a revolutionary technique called Genetic-Adaptive Teaching Learning-Based Optimization (GA-TLBO) integrates genetic algorithms with Teaching-Learning-Based Optimization (TLBO). To deliver a more individualized and effective educational experience, the aim is to improve several vocal music education-related factors, including curriculum design, student and educator interactions, as well as unique learning routes. While TLBO denotes the inspiration taken from the TLBO method for knowledge transmission and improvement, "Genetic-Adaptive" suggests the application of GA to adapt and develop responses to educational challenges. The TLBO method's initial setup, generating randomly formed solutions, will be incorporated into the fundamental iterative process of inventive reform for diverse vocal music instruction. These solutions will move through the teacher and student phases as the iterations continue to improve as well as hone the teaching methodology. Equation (1) is used to modify or enhance the instructor component in the context of vocal music education reform.

$$Y_{new}^j = Y^j + S \otimes (H - sM) \quad (1)$$

The equation consists of the following parts: H is the best solution, S is a random vector, $\otimes$ denotes the Hadamard products, s is a random number and M is the vector of the mean obtained from every option. To finish this procedure, Y^j fresh has to be updated with Y^j, which stands for a unique solution. All Y^j numbers in which the price of Y^j is higher than the value of Y^j new are covered by this update $cost(Y^j) > cost(Y_{new}^j)$. By using equations (2) and (3), the answers are enhanced and refined during the student phases.

$$R = sign(cost(Y^s) - (cost(Y^j))) \quad (2)$$

$$Y_{new}^j = Y^j + Rs \otimes (Y^j - Y^s) \quad (3)$$

When the $Sign(y)$ operation, which equals -1 for positive values and 1 for nonnegative ones. The equation consists of many parts: S stands for a random vector; Y^s for a randomly chosen solution from the resulting

space; s for an arbitrary number and $\otimes$ for the Hadamard product sign. To complete this procedure, for any Y^j variables where the price of Y^j exceeds the price of Y_{new}^j, Y_{new}^j will substitute Y^j. Figure 1 is an illustration of the overview of TLBO.
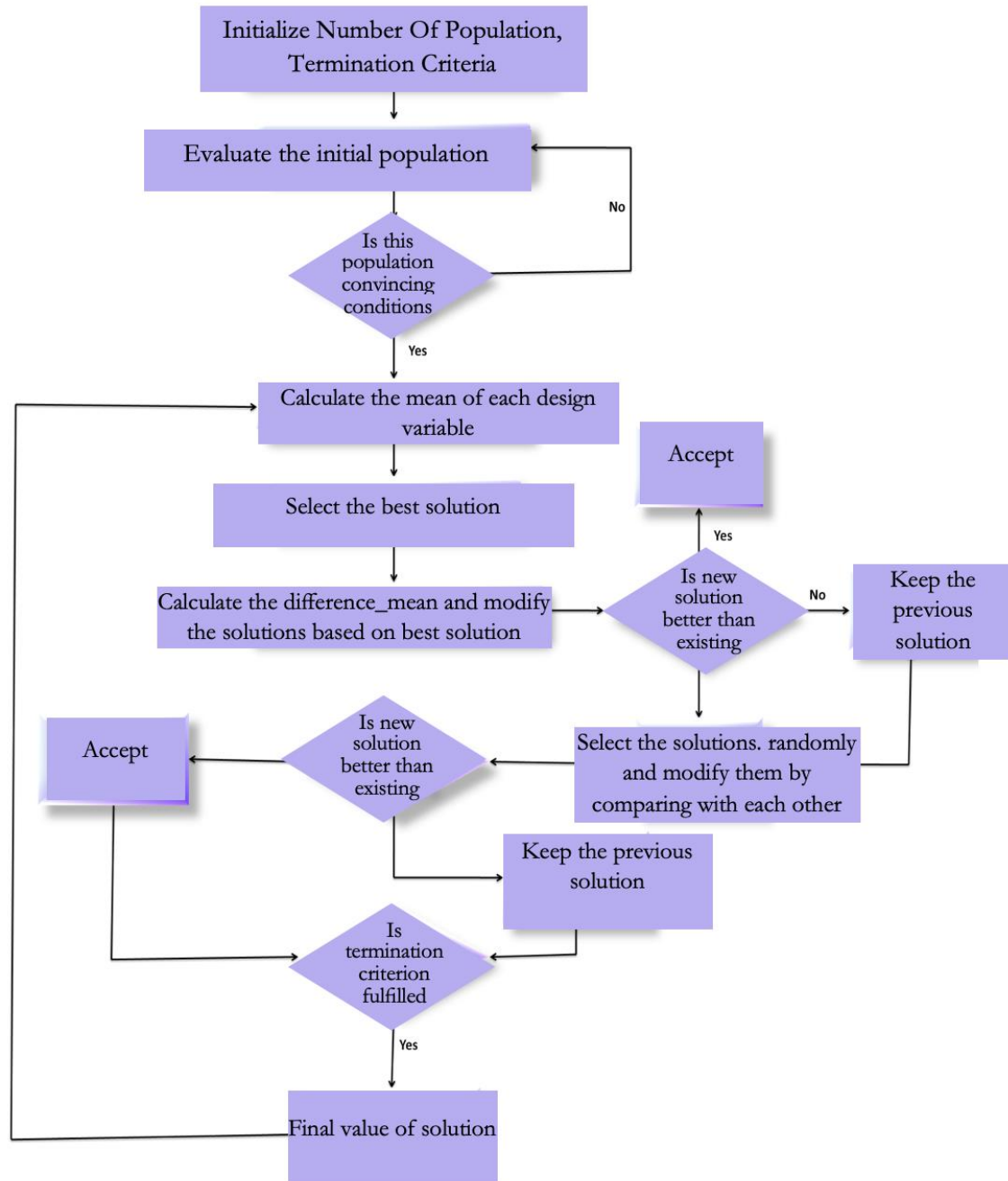

Figure 1: Overview of TLBO

It was realized that a more robust exploration component was needed for TLBO in the reforming of diverse vocal music education. The student component of TLBO has been replaced with a genetic algorithm in recognition that no other approach could satisfy the demand. In addition,

changes have been made to the instructor phase to make it more exploitation-focused and to balance exploration and exploitation in the suggested algorithm. Adjustments are made to the teacher update phase using the equation (4).

$$Y_{new}^{j} = Y^{j} + s_1 H - s_1 s_2 Y^{j} \qquad (4)$$

In this scenario, equation (4) involves variables s_1 and s_2, which represent random numbers and H, signifying the best solution. To conclude this process, Y_{new}^{j} should replace Y^{j} when the cost of Y^{j} is greater than the cost of Y_{new}^{j}. A modification is presented about the reform of vocal music education, whereby Y^{s} a variable that denotes a solution is set to equal Y^{j}. The purpose of this adjustment is to allow Y^{j} advancing according to how close it is to the best instructor (Tg). In essence, it promotes more investigation when a solution is farther away from the most excellent instructor and emphasizes exploitation when a key is closer to the best teacher. Furthermore, the chance vector element has been reduced to a single randomized number, which transfers the responsibility of exploration from the teacher phase of TLBO to the genetic algorithm stage. Natural evolutionary concepts are the basis of all Evolutionary Algorithms (EAs). The basic laws that govern living things result from specific processes that are applied consistently, such as heredity, mutation, crossing over and selection. Heuristics are preferred over determinism in nature when it comes to improvement. The GA was created for use in research on operations by applying these simple principles found in nature. Meta-heuristics is a common term used to describe these heuristic evolutionary algorithms. A population-based optimization technique used in the context of reforming vocal music education is called GA. In this method, every population uses a variety of operators, such as selection, recombination and mutation, to try to improve and evaluate it. These operators are the heart and soul of the algorithm; all changes are centered on them. Each solution includes a set of characteristics that will be improved upon in the next iteration. First, a fitness function assessing the quality of the answers is used to generate random responses for initial evaluation. All of the original answers are converted into genotypes to improve accuracy. When a specified number of iterations are achieved, or the fitness exceeds the chosen threshold, the algorithm is terminated. Therefore, a fitness function and genetic representation are the essential elements of every GA. It is found that bit representation, a typical candidate genotype, suffices for efficient representation. Although GAs is

linked to trees to facilitate exploration, developers have to deal with their significant memory usage. Three essential processes comprise the GA process in reforming vocal music education: mutation, crossing over and selection. A roulette wheel selection with linear ordering is used to manage the selection procedure. Furthermore, a single-point crossing-over functional is employed for the recombination phase. In terms of mutation, the probability of a mutation in each gene is 0.7 divided by the overall number of genes. The best answers from the new and previous approaches are selected at this point to move on to the following iteration. Figure 2 illustrates this genetic process.
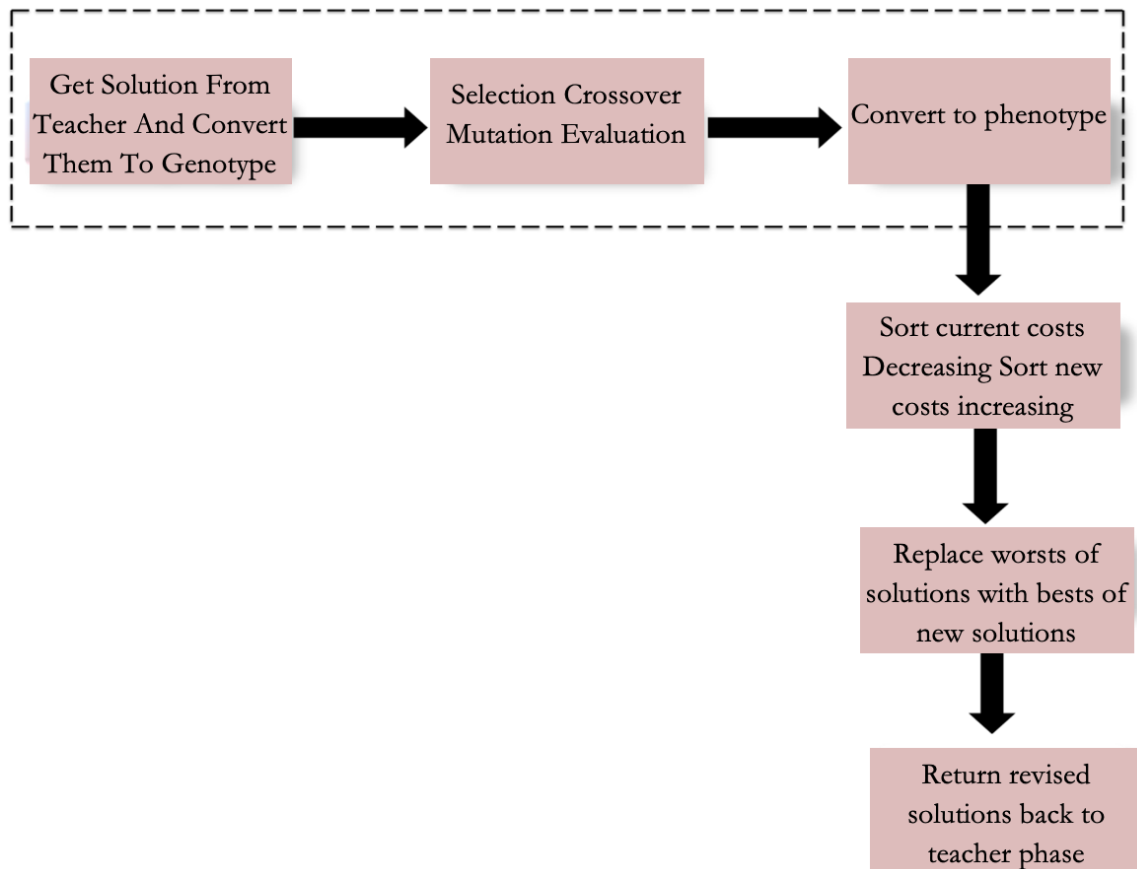

Figure 2: Process of Genetic Algorithm

The algorithm describes the general architecture of a GA-TLBO method in the context of reforming vocal music education. It starts by specifying important parameters and initializing a group of possible solutions. A predetermined number of generations are iterated through the primary optimization loop. The fitness of every solution is assessed each iteration and a selection procedure is used to choose teachers and students in the population at large based on fitness. The algorithm incorporates genetic operations, such as mutation and crossover, on the pupils and information

transfer inspired by TLBO. The most excellent solutions will be carried forward into the following generation when teachers and pupils are combined to produce a new population. Finding the best way to enhance vocal music education by repetition of the process over a certain number of generations is the goal and the best answer can be used in the reform initiatives. Algorithm 1 represents the process of the proposed method (GA-TLBO).

Algorithm 1: Process of GA-TLBO

```
Const int population Size = [];
Const int num Generations = [];
Const double mutation Rate = [];
Struct Individual {
std::vector< int > genes;
Double fitness;
};
Void Initialize Population (std::vector<Individual>& population) {
For (int i = 0; i < population Size; ++i) {
Individual;
Individual. Fitness = Calculate fitness (individual);
Population. Push _ back (individual);
}
}
Double Calculate fitness (const Individual& individual) {
Return 0.0;
}
Void Selection (std::vector<Individual>& population) {
}
Void Crossover (std::vector<Individual>& population) {
}
Void Mutation (std::vector<Individual>& population) {
}
int main() {
std::vector<Individual> population;
Initialize Population (population);
For (int generation = 0; generation < num Generations; ++generation) {
Selection (population);
Crossover (population);
Mutation (population);
}
```

Individual best solution = Find Best Solution (population);
std::cout << "Best Solution: " << best Solution .fitness << std::endl;
Return 0;
}

4. RESULT AND DISCUSSION

This study demonstrates how the GA-TLBO technique can optimize project scheduling issues and raise the sector's learning rate.

4.1 Experimental setup

The machine arrived, including quad-core 2.83 GHz CPUs and four gigabytes of memory and the optimized GA-TLBO technique had been developed employing Microsoft Visual Studio 2008 C++. The test data collection adopts the J120 and J30 test sets in Project Scheduling Problem Library (PSPLIB) as well as the intention of allocating the l-th substance, the PSPLIB's l-th material constraint represents the highest value of the commitment quantity $b_{l_{max}}$ the expenses of each of the resources are $dl = 1, l = 1, 2, \ldots, L,$ The costs associated with all assets are $\theta = .95$ and P = 100, correspondingly. 50,000, 5,000 and 1,000 planning strategies are employed as terminated requirements during each participant's assessments of performance.

4.2 Score for evaluating algorithms

Utilizing the derived non-dominated option with a specified size and progress measures, the approach is assessed. The non-dominated option set converging indicator, sometimes called the C measurement, indicates the outcome in the no-dominated substance group.

The larger the size of the non-dominated substance group, the greater the number of options the technique can produce, reciprocal dominance to some extent. Regarding a couple of non-dominant collections of approaches $S1, S2 \subseteq y$, the definition of S_1's C index concerning S_2 is as described below:

4.3 Comparing and Evaluating Experimental Statistical Results

To assess its efficiency, the optimized GA-TLBO technique remains contrasted with current algorithms, the ETLBO technique and the TLBO algorithm, which have the fastest and most efficient response times. The median non-dominated response quantity for the J120 and J30 test

collections is displayed in Tables 1 and 2, correspondingly for the TLBO, ETLBO and GA-TLBO algorithms. Tables 1 and 2 represent that the un-dominated result established through the customized TLBO according to 1,000, 5,000 and 50,000 organizes have been fewer compared to that of the ETLBO and TLBO methods. This corresponds to evidence in both instances of the J120 test set and J30 test collection, in addition to the 2 scenarios of J30 and J120. The preceding information indicates that the GA-TLBO technique can match the performance of the ETLBO and TLBO methods; its execution is less effective or quick to perform. Since the improved TLBO technique is slower compared to the original TLBO technique, it is bigger compared to the ETLBO technique. This is because the algorithmic approaches that continue to solve problems following multiple evaluations are known as TLBO and ETLBO. The method can endure testing in terms of operation quickly and effectively; these metrics need to reflect rate and equilibrium accurately. Instead, more significant substances yield more effective algorithmic performance. At the same time, the solutions not dominated by the TLBO and ETLBO methods are more excellent. Their level of performance could be superior and could not be ensured. To assess the efficiency of the approach, the sum of the non-dominated substance established converging score is used in the subsequent preceding section.

Table 1: Solutions of J30 set

Algorithm	Schedules		
	50,000	5,000	1,000
ETLBO	15.9	17.7	16.55
GA- TLBO	12.09	11.47	10.56
TLBO	18.13	15.33	12.47

Table 2: Solutions of J120 set

Algorithm	Schedules		
	50,000	5,000	1,000
ETLBO	17.05	18.9	17.71
GA-TLBO	13.23	12.58	11.69
TLBO	19.07	16.27	21.09

The ETLBO strategy is contrasted with the TLBO method and the optimized GA-TLBO strategy according to the effort to represent the signals associated with the non-dominated candidate collection accurately. Figures 3 and 4, display the coefficient concentrations of the J30 and J120 experiment collections, demonstrating how the arrangement among indicators varies while the termination threshold is $1,000\ to\ 50,000$

programming integers. Figures 3 and 4 illustrate the estimation amount and the average parameters associated with the TLBO approach signal have a significant relationship when the J30 test collection is employed. The TLBO and ETLBO techniques negatively correlate as the scheduler amount increases. The estimated amount of the ETLBO method measurement continues to rise according to the circumstances of the J120 test set despite the fact the present development has yet to be apparent. The following are occurring for the overall distribution of the TLBO technique and the ETLBO method indexing. The following is evident while the amount of arranging is increased. The GA-TLBO method exhibits an adverse association with schedule count, exhibiting a declining trend as schedule count rises. Figure 3 and Figure 4 make it evident that, for every removal scenario ranging from 1,000 – 50,000, regardless of whether the sample established is massive amounts J120 or small-scale businesses J30, the average charges associated with the indicators for the power source customized TLBO procedure are decreased compared to those regarding the ETLBO technique, indicating a higher degree of converge. The transportation amounts of the ETLBO technique and the GA-TLBO technique have been less than those of the GA-TLBO technique, signifying an improvement between the two algorithms. The GA-TLBO technique greater than the ETLBO technique, is the sequence in which the three algorithms converge.
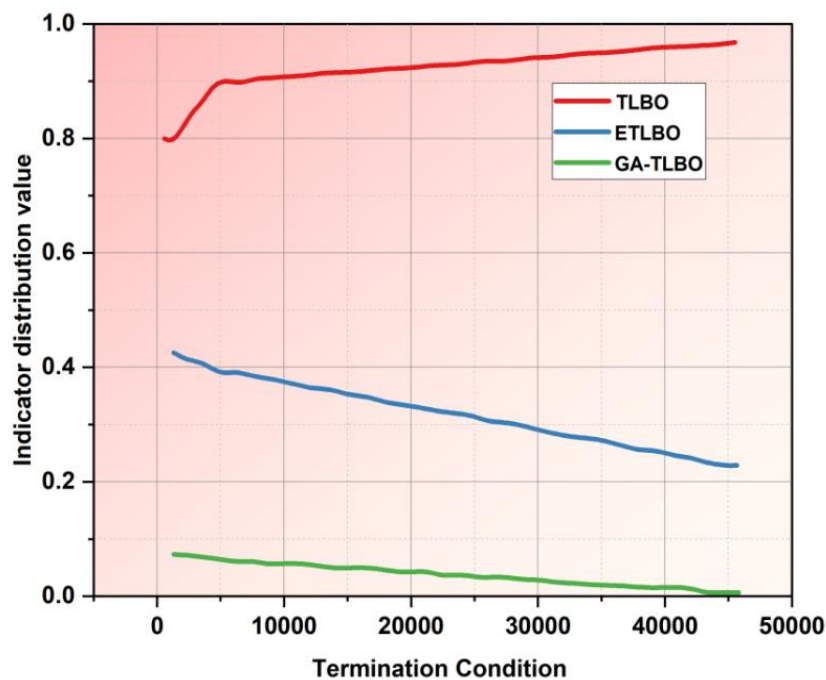

Figure 3: TLBO Algorithm GA-TLBO Technique and J30 ETLBO Technique Index Distributions
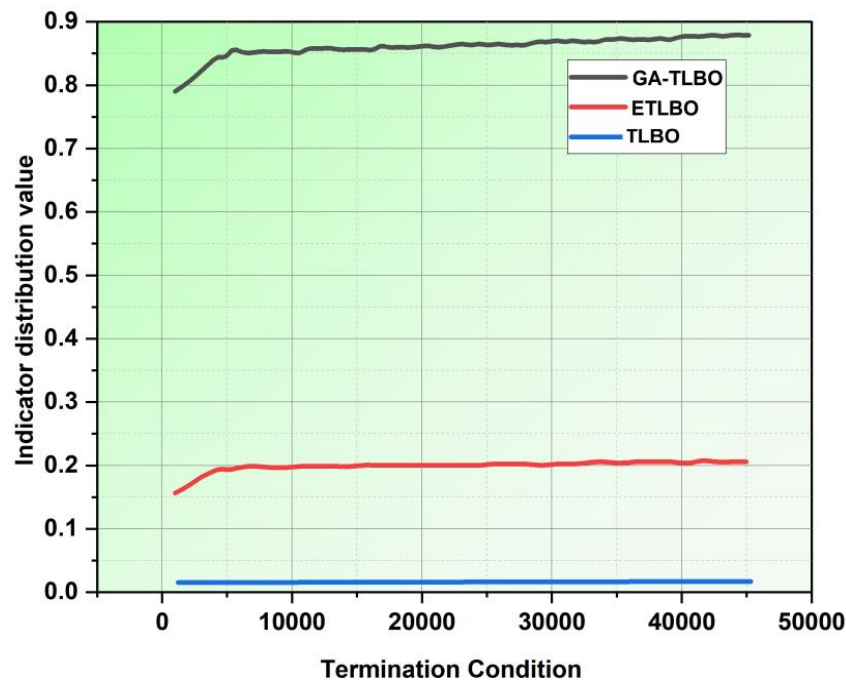
Figure 4: TLBO Algorithm GA-TLBO Algorithm and J120 ETLBO Algorithm Index Distribution

For instance, C = .02 is obtained using the J120 test collection, assuming the most significant amount of establishes is 50,000. This indicates that although two percent of the outcomes that compose the non-dominated substance collection for the GA-TLBO technique are controlled through the solutions that are not dominated by the ETLBO technique, 92% during the TLBO technique's substances are either exploited or not complementary controlled by the total imports through the non-dominated the essence established of the GA-TLBO technique. Within the prevailing solution used collection, the responses either subjugate or do not subjugate one another. As a result, assuming the identical quantity of computation, the answers without dominance collection produced by the GA-TLBO method were clearly of more excellent quality than those produced by the ETLBO technique and each appeared to be superior to the outcomes of the TLBO technique. The efficiency rating assigned to the non-dominated solutions collections created by the 3 techniques for the ETLBO, TLBO and GA-TLBO techniques corresponds to the listed below: TLBO algorithm < ETLBO algorithm < GA-TLBO algorithm that has been optimized. The following confirms the above conjecture as well. The TLBO and ETLBO algorithms provided more extensive non-dominated approaches. The level of accuracy of these outcomes is, in fact, more severe than that of the GA-TLBO technique, the additional efficient technique provided by the algorithm. A comprehensive strategy incorporating many essential components is required to improve the learning rate in vocal

music education. It is critical to understand that learning vocal music is more significant than acquiring material quickly; knowledge of it includes developing and improving the learning process. However, several techniques have the potential to be used to enhance the degree of learning and efficacy of vocal music education. It is possible to use a comparison equation to indicate the enhancement or gain that is achieved with the suggested approach over the conventional way when comparing a traditional method, which is thought to be low in performance, with a GA-TLBO, which is believed to be high in performance in Figure 5 and Table 3. This comparison shows that our suggested approach has a distinct edge over the other, emphasizing its greater efficacy and efficiency in reaching the intended result.

$$Learning\ Rate = \frac{Individual\ Practice\ Time \times Quality\ of\ Feedback}{Collaborative\ Learning\ Experiences \times Cultural\ Context} \quad (5)$$

The suggested method produces better results when compared to standard approaches when the learning rate matrix is compared, highlighting its critical importance in furthering vocal music education reform. Its ability to improve learning outcomes and meet the demands of a wide range of students emphasizes how important it is to create an atmosphere that is more dynamic and influential for students studying vocal music.
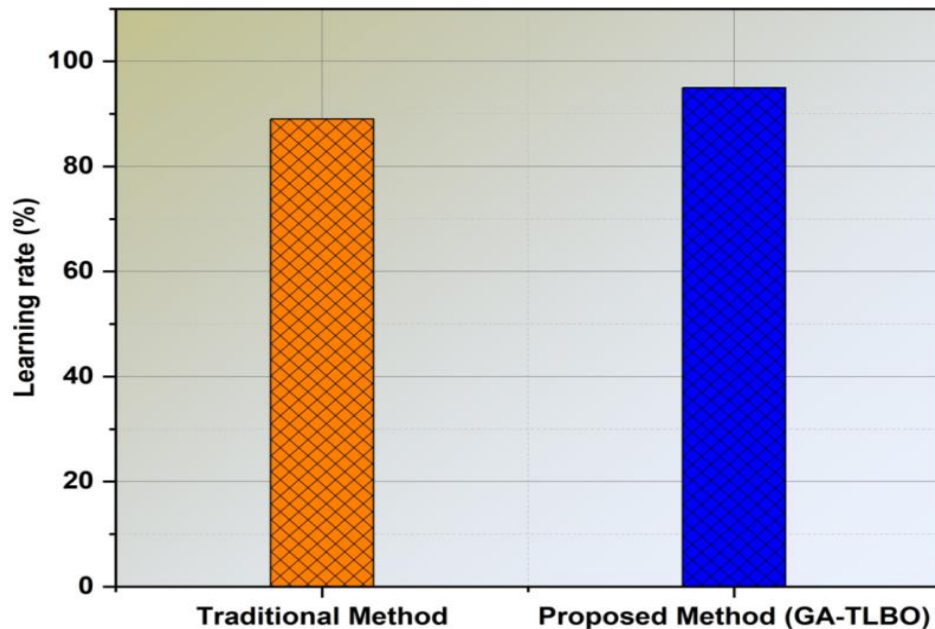

Figure 5: Comparison of Traditional and Proposed Method

Table 3: Result for Traditional and Proposed Method

Methods	Learning rate (%)
Traditional Method	89
Proposed Method (GA-TLBO)	95

The goal of instruction is to assist students in comprehending and developing proficiency in various song categories, create a foundational sense of stability in their voice, expression and performance when singing and first build their distinctive singing voice. Chinese songs, including folk ballads and translated versions, original pieces from Chinese operas and some timeless tunes from ethnic minorities are the primary musical selections. The goal of education should help students develop their artistic and emotional expression so they can learn to read and interpret a variety of musical styles and create their unique singing style. Figure 6 and Table 4 display the expert's assessment of the fundamental theories of vocal music and the vocal works performed in the integrating education of ethnic vocal music.
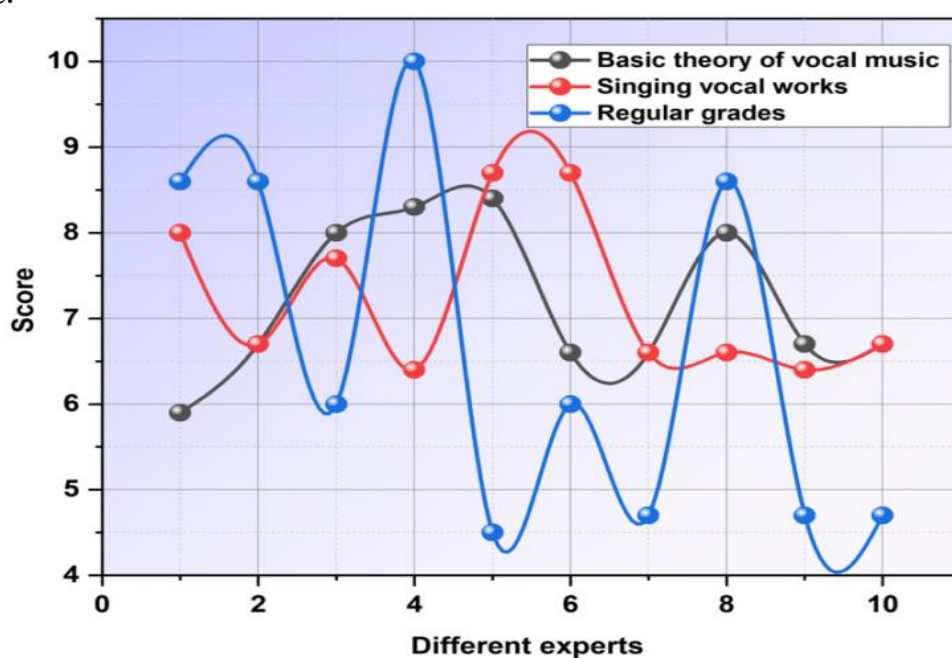

Figure 6: Expert Evaluation for Efficiency in Vocal Integration Education, Vocal Works Sung, and Fundamental Vocal Theory

Table 4: Evaluation Values For Efficiency in Vocal Integration Education, Vocal Works Sung, and Whole Vocal Theory

Values	The basic idea of vocal music	Singing vocal works	Regular grades
1	5.9	8	8.6
2	6.7	6.7	8.6
3	8	7.7	6
4	8.3	6.4	10
5	8.4	8.7	4.5
6	6.6	8.7	6
7	6.6	6.6	4.7
8	8	6.6	8.6
9	6.7	6.4	4.7
10	6.7	6.7	4.7

A sound supplemental teaching strategy is group instruction. This option is available for first and second grade, having one to twenty pupils in each of the 2 weekly lessons. Students can observe their movements and facial expressions in the classroom due to a large mirror. The course's major topics include the fundamentals of vocal music (vocal organs, various singing techniques, resonance, themes and forms of singing), its history, the audio-visual performances of renowned Chinese and international vocalists, regular vocal music observation and the commonalities of vocal music. Teachers should focus on modifying the classroom environment, appreciating each student and providing them with additional opportunities to ask questions and share their work during the teaching process. Figure 7 and Table 5 display the students' satisfaction with multimodal instruction in this article.
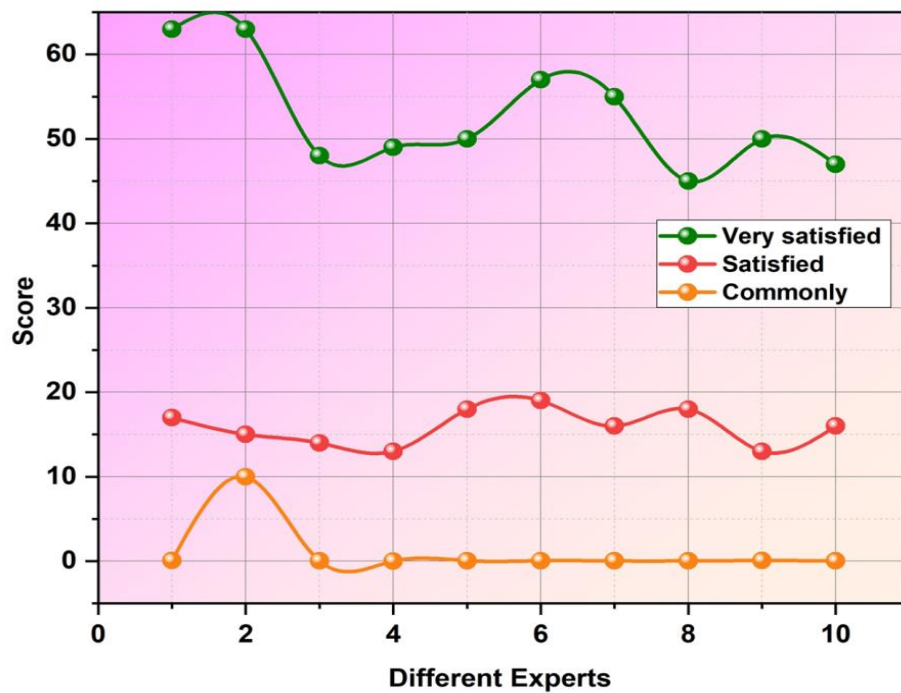

Figure 7: Level of Student Satisfaction With Multimodal Instruction.

Table 5: Values of Level of student satisfaction with multimodal instruction

Values	Very satisfied	Satisfied	Commonly
1	63	17	0.08
2	63	15	10
3	48	14	0.03
4	49	13	0.02
5	50	18	0.05
6	57	19	0.06
7	55	16	0.04
8	45	18	0.04
9	50	13	0.07
10	47	16	0.04

5. DISCUSSION

The discussion compares and contrasts a suggested GA-TLBO technique with conventional algorithms. The test collections are (J30 and J120) used to schedule operations. It goes into more detail about the evaluation process, contrasting the GA-TLBO approach with other approaches using non-dominated solutions and the C measurement. The section emphasizes that although the GA-TLBO technique can be slower or less efficient, it performs similarly regarding non-dominated outputs. It explores the connection between schedule count and performance, highlighting various behaviors algorithms display when it rises. The paper concludes that the GA-TLBO methodology outperforms the TLBO and ETLBO methods regarding efficiency convergence and relative performance of the processes in various scheduling circumstances.

6. CONCLUSION

By using the cutting-edge GA-TLBO technique, they aim to transform the teaching of vocal music while promoting cross-cultural understanding and adaptive learning. Using numerical simulations, the findings showed that, in 92% of the situations, the ETLBO performed better than the GA-TLBO, demonstrating its effectiveness in improving student performance and cross-cultural interchange. They emphasized how crucial flexible learning environments are to prepare students for a global economy. Despite its effectiveness, it was found to have limits in terms of scalability and application to other educational situations. Therefore, the study's future focus will be on improving the ETLBO's adaptability and broadening its use, enhancing music instruction in higher education worldwide.

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