Construction and Application of an Interactive Teaching Platform for Aesthetic Education in Ecological Environments

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ABSTRACT

Kruskal algorithm, as a minimum spanning tree optimization analysis algorithm, has been well used in the field of industrial production to find the optimal parameters. In this study, an interactive teaching platform based on Kruskal algorithm is built based on the ecological aesthetic education theory. Secondly, based on multiple internet of things systems, through the analysis of the problems existing in traditional classroom teaching, combined with the characteristics of ecological aesthetic education, the interactive platform can automatically generate more efficient teaching courses and related methods. Finally, this study verifies the reliability and stability of the above platform through experiments and practices. The experimental results show that the application of the theory and method of ecological aesthetic education in the interactive teaching platform based on Kruskal algorithm achieves the combination of traditional classroom teaching and ecological aesthetic education and gives full play to the main role of students in the classroom.

KEYWORDS

Ecological Aesthetic Education, Interactive Teaching, Internet of Things Platform, Kruskal Algorithm

The main objective of aesthetic education in universities is to improve students' aesthetic ability and humanistic understanding, playing an indispensable and irreplaceable role in cultivating virtue and character. With the advent of a new era in China's ecological civilization construction, integrating ecological content into university aesthetic education and forming a novel concept of "ecological+" aesthetic education not only aligns with contemporary needs and the direction of aesthetic education reform but also addresses challenges in current university aesthetic education practices. While traditional aesthetic education focuses on cultivating students' aesthetic abilities and humanistic literacy, the ecological aesthetic education mechanism encompasses these aspects while prioritizing the cultivation of students' ecological aesthetic abilities and humanistic literacy. Integrating ecological aesthetics into university aesthetic education can guide students to examine themselves, their environment, and society with an ecological aesthetic attitude, embracing a connection with nature, appreciation for life, resilience in facing difficulties, and a respectful attitude toward all life forms, ultimately establishing a healthy psychological consciousness.

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Ecological aesthetic education within aesthetic education refers to the combination of ecological education and aesthetic concepts, aiming to cultivate students' awareness, concern, and protection toward the ecological environment through aesthetic engagement. Aesthetic education involves fostering individuals' appreciation for beauty, developing their aesthetic emotions and abilities, and cultivating their cultural understanding through artistic expression, cultural exploration, and aesthetic activities. In the context of ecological aesthetic education, the goal of aesthetic education is to guide students to gain a deeper understanding of ecological issues like ecosystems, biodiversity, and sustainable development through the elements of art, culture, and the natural environment. This approach stimulates students' ecological and artistic perceptions, fostering a sense of ecological and ethical values to better protect and preserve the natural environment. This approach aims to enhance students' sensitivity of the ecological environment, stimulating their creativity and innovation to tackle current environmental challenges.

Aesthetic education plays an indispensable role within the education system, extending beyond a course or activity to embody a philosophy of lifelong learning and holistic development. It encourages individuals to express their creativity and emotions, developing innovative thinking and problem-solving skills. In addition, aesthetic education improves mental well-being by reducing stress and anxiety. It also helps cultivate social skills, promoting teamwork and social interaction. By learning about different arts and cultures, individuals can enhance cultural understanding, respect, and cultural sensitivity. Most importantly, it stimulates students' academic interest and motivation, thereby improving learning engagement and academic achievement. Thus, aesthetic education plays an important role in personal development within the education system, concurrently enriching cultural dynamics in society and nurturing talent.

At present, scholars both domestically and internationally have studied ecological aesthetic education. However, most studies focus on traditional classroom teaching methods, neglecting the potential applications of ecological aesthetic education in other aspects (Nichols & LeBlanc, 2021). Relying on an interactive teaching platform is a promising avenue for introducing ecological aesthetic education into classroom teaching, thereby improving students' engagement, classroom efficacy, and academic performance (Ango et al., 2022).

Although existing interactive teaching platforms have realized teacher-student interaction to some extent, they largely fail to reflect the characteristics of ecological aesthetic education. As a new educational concept, ecological aesthetic education centers around the harmonious coexistence between human beings and nature (Powdthavee, 2021). Within ecological aesthetic education, the teacher assumes the role of a guide, and the student is a receiver. As guides, teachers should pay attention to cultivating students' interest in learning, mobilizing their enthusiasm for learning, and nurturing their proactive learning attitudes (Goodwin et al., 2022).

At present, many universities grapple with issues related to curriculum design and awareness of ecological aesthetics, resulting in an imbalance in the development of ecological aesthetics education. Most universities do not offer courses dedicated to ecological aesthetics and related disciplines. Furthermore, there is a stark disparity in the distribution of societies and social practice activities related to ecological aesthetics education. Ecological aesthetics education is not only limited to traditional classroom teaching. It is reflected in various forms, including college student clubs and social practice activities. However, college students generally possess a limited understanding of ecological aesthetics, as they have seldom encountered courses related to the subject before entering university.

Addressing the challenges of limited student interaction and low teacher engagement in existing ecological aesthetic education methods, this article studies the application of interactive teaching Gaussian classification model based on the Kruskal algorithm. The innovation of this research lies in the design of a high-dimensional adaptive method for identifying the minimum spanning tree using the Kruskal algorithm. In addition, a Gaussian classification model based on data dimension analysis is built, alongside the development of an interactive teaching platform capable of quickly analyzing optimal solutions.

The model not only realizes the analysis and uploading of learning data from different student profiles throughout the teaching process but also makes full use of the differences and universalities between different ecological aesthetic types. With the help of a free classification model with high accuracy, the model enables dual-channel analysis, ultimately culminating in intelligent optimal solution output.

Moreover, using the Gauss-Kruskal factor to match and classify different types and dimensions of data information in the process of ecological aesthetic teaching can effectively improve the accuracy of its calculation.

The article is divided into four sections. Section 1 introduces common methods employed in ecological aesthetic education and outlines the overall structure and innovation of this study. Section 2 delves into the research status surrounding the design of interactive teaching platforms and interactive data analysis both at home and abroad. Section 3 focuses on the development of an adaptive Gaussian classification model for online ecological aesthetic education based on the Kruskal algorithm, along with an interactive ecological aesthetic education platform within the internet of things (IoT) framework using the Gauss-Kruskal equation method. Finally, section 4 assesses the error rate and adaptability of the online interactive teaching model constructed in this article through practical testing and analysis of results, concluding with findings drawn from the study.

RELATED WORK

In the current research on ecological aesthetic education methods in colleges and universities, many scholars both domestically and internationally have explored different directions and made many achievements (Adjei et al., 2021). For instance, Ni (2021) has categorized methods of ecological aesthetic education based on student types, conducting multiple combinations according to individual characteristics. Chen (2022) found significant errors in the teaching design of ecological aesthetic education in foreign colleges and universities, hindering its large-scale application due to internal inconsistencies. Thus, they proposed an interactive teaching classification system based on short-term memory characteristics.

Yuan et al. (2021) found substantial differences in aesthetic appreciation among various types of ecological works. They proposed a teaching platform based on color vision error delay, with adaptive improvements reflecting ecological aesthetic characteristics. However, they encountered drawbacks in scalability. Lin and Chang (2022) underscored the importance of developing a data matrix teaching system based on multiple aesthetic degrees, realizing individualized instruction and compensating for differences according to students' aesthetic talents (Lin & Chang, 2022).

Patureau et al. (2021) found that many professors in modern university classrooms still carry out static teaching methods rooted in traditional two-dimensional aesthetics, ignoring the potential effects of intelligent algorithms and dynamic aesthetic strategies on different student populations. Therefore, they proposed a high-value classification teaching strategy based on genetic algorithms. Furthermore, they analyzed the lack of a comprehensive multi-angle aesthetic system and methodology in both domestic and foreign ecological aesthetic education research, proposing a theory of ecological aesthetic education based on short-time and multi-attitude integration. This is also verified through empirical research (Ahmad et al., 2019).

Zhen et al. (2022) combined interactive teaching strategies with like the Kruskal algorithm improving the framework of ecological aesthetic education. They constructed an intelligent matching analysis system based on multidimensional space-time soul algorithm, tailoring teaching mechanisms to individual student responses. Prat et al. (2021) proposed a classification algorithm with high matching degrees based on multi-angle framework thinking decision-making levels, conducting experimental teaching for students of different ages to meet common requirements and teaching objectives in ecological aesthetic education in colleges and universities.

Li et al. (2022) found knowledge gaps and classification fuzzy points in ecological aesthetic education. Combined with IoT technology, they built a multi-dimensional value matching analysis interactive teaching strategy adaptable to various student aptitudes, albeit suited for Western ecological aesthetic education, thus exhibiting certain limitations.

Based on the aforementioned domestic and international research, it can be found that studies on ecological aesthetic education focus on the innovation of educational methods and the building of interactive teaching platforms, while rarely carrying out breakthrough innovation in online multi-person interaction (Connolly et al., 2021). Moreover, existing innovative teaching models mostly adopt regressive difference algorithms based on reliability classification, which makes the existing teaching models less practical and inconsistent with actual teaching directions and objectives (De Brún et al., 2022). Therefore, it is of great significance to study the interactive teaching methods for ecological aesthetic education in universities based on the Kruskal algorithm and the digital architecture of the IoT (Adkins, 2021).

METHODOLOGY

Kruskal Algorithm in Interactive Teaching for Ecological Aesthetic Education in Universities

The Kruskal algorithm, introduced by Joseph Kruskal in 1956, is used to find the minimum spanning tree (Saifer & Dacin, 2022). Similar problems can be solved using the Prim and Boruvka algorithms, all of which are applications of greedy algorithms (Keleg et al., 2021). Unlike the Prim algorithm, Kruskal's time complexity is not completely determined, making it more suitable for situations with sparsely connected networks (Chen et al., 2021). Thus, the Kruskal algorithm does not prioritize optimizing the overall solution. Instead, it achieves high-value matching analysis through multiple operations and verifications within a confined scope. This enables the algorithm to solve different types of multidimensional vector groups, optimize difference schemes based on character data, and provide optimal data solution information (Leong et al., 2021).

Based on this foundation, this article uses the IoT technology, Kruskal algorithm principles, and interactive information collection technology to optimize the interactive teaching platform for ecological aesthetic education in colleges and universities. It puts forward a method for constructing an interactive teaching platform based on the Kruskal algorithm (Mosterd et al., 2021). The application concepts and common types within the interactive teaching platform are illustrated in Figure 1. The Kruskal algorithm's specific implementation process is as follows. First, it sorts all edges in the graph in descending order of weight. Second, it selects each edge in the sorted order and proceed as follows:

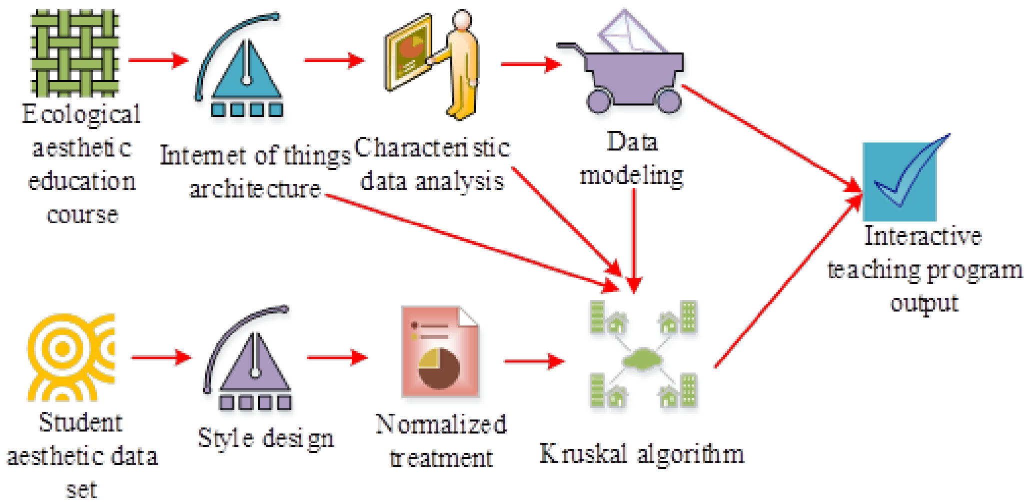
1. If the two endpoints of this edge are not in the same set, merge the two sets and select this edge.
2. If the two endpoints are in the same set, discard this edge. Do not choose to repeat step 2 until all points are added to the spanning tree.

Finally, the resulting spanning tree is the minimum spanning tree.

Construction Process of Interactive Teaching Platform Model Based on the Kruskal Algorithm

First, based on the Kruskal algorithm theory, an interactive teaching platform serves as the carrier, operating at three distinct levels: (1) classroom teaching; (2) network classroom; and (3) real-life experiences (Li et al., 2021). Second, the interactive teaching platform is built based on the Kruskal algorithm. Within ecological aesthetic education, it includes three primary aspects. In the course

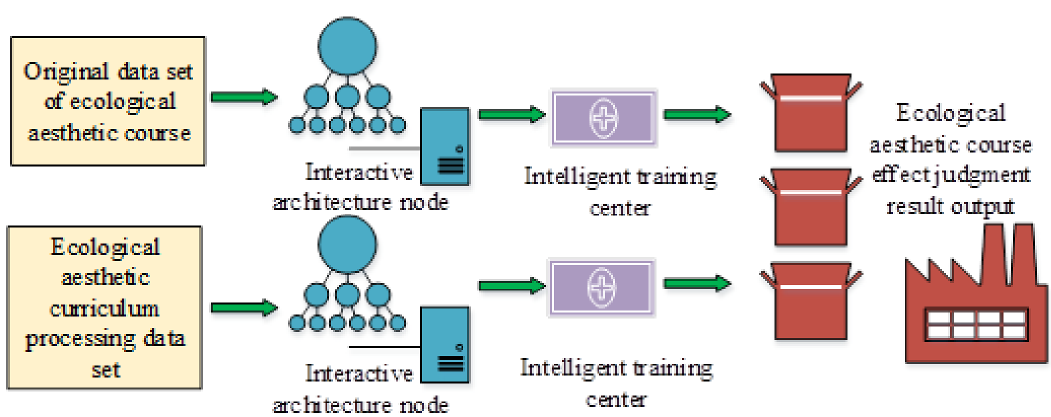
Figure 1. Application of the Kruskal algorithm in interactive teaching platforms



design process, the principles and methodologies of ecological aesthetics are applied to the curriculum through modern scientific and technological means, thereby combining the course content with design. Then, in the online classroom setting, educators deliver ecological aesthetic education content to students via the internet, facilitating the fusion of technology and teaching objectives (Qin et al., 2021). Next, college students engage in both "life experiences" and "aesthetic experiences" through online platforms.

Finally, based on the Kruskal algorithm and the fundamental principles of interactive ecological aesthetic education teaching platforms, integration and research are carried out across educators, students, teaching content, and teaching methodologies. In the process of English learning, a student-centered approach can fully mobilize students' interests and improve learning efficiency. Within the online classroom, educators can leverage the platform advantages and resources to enhance students engagement through interaction features (Vinjamuri & Rao, 2021). The construction process of the integrated multi-architecture network nodes, based on the Kruskal algorithm, is shown in Figure 2. Kruskal's specific algorithm is detailed in the Appendix.

Figure 2. Construction process of integrated multi-architecture network nodes based on the Kruskal algorithm



University B, selected for this study, is a comprehensive university. A total of 631 students from this university were selected, with questionnaires distributed for assessment. All 631 questionnaires were deemed valid, resulting in a 100% recovery rate. Freshmen made up 11.73% of the student body, sophomores accounted for 61.65%, juniors comprised 24.88%, and seniors represented 1.74%.

The 631 students were divided into experimental and control groups. The experimental group, made up of 316 students, used the interactive platform for education. The control group, comprised of 315 students, used traditional teaching platforms.

The questionnaire was distributed prior to the experiment, categorizing responses into three score bands: scores of 80 and above represented a high level of understanding of the specific connotations of aesthetic education; scores between 60 and 79 indicated a general understanding; and scores below 60 indicated a lack of understanding. The results show that before the test, approximately 14.29% of students in the experimental group considered themselves "very knowledgeable," while 58.73% indicated they were "generally knowledgeable," and 26.98% reported being "basically unaware." Similarly, in the control group, 12.66% of the students were "very well informed," 60.13% were "generally informed," and 26.22% were "not at all informed."

To enhance student experience, the interactive teaching platform provides a wealth of video footage with ecological aesthetic education case studies and field trips. These videos combine theoretical knowledge and practical applications, helping students better understand the practical use and impact of aesthetic education.

Regularly online discussions are scheduled to facilitate interaction and knowledge sharing among students. These discussions encourage students to share their insights, ask questions, and exchange experiences. Such interactions can enrich the student experience as they think about and learn from diverse perspectives.

Online quizzes were implemented to assess students' understanding of each topic. These quizzes serve a dual purpose. First, they help students in reinforcing their learning. Second, they serve as an effective assessment tool for teachers to gauge students' progress in the field of aesthetic education.

At the end of the course, a questionnaire with a score of 100 was administered to the 631 students who participated in the aesthetic education instruction. The questionnaire was administered again to after the experiment to assess any changes in the level of understanding. The results showed that after the test, approximately 34.92% of students in the experimental group indicated they "understood it very well," 47.62% indicated they "understood it generally," and 17.46% indicated they "did not understand it at all." In the control group, 17.41% of the students reported being "very well aware," 56.96% reported being "generally aware," and 25.63% reported being "not at all aware."

It is worth noting that during the semester of aesthetic education, students in the experimental group showed higher levels of motivation. They were more frequently engaged on the online teaching platform, actively participated in online discussions, and proactively explored the specific connotations of aesthetic education. This demonstration of motivation was not only reflected in their increased level of understanding but also in their frequent downloading of learning resources and active participation in online quizzes. These observations suggest that the internet teaching platform not only increased students' understanding but stimulated their interest in participating more actively in learning and exploring the field of aesthetic education.

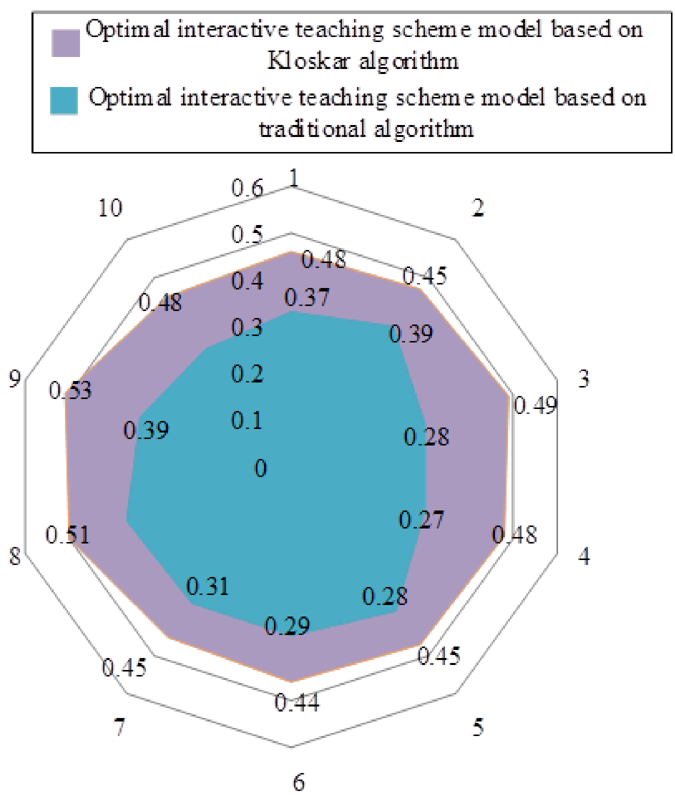
The significant progress made by students in the experimental group in aesthetic education highlights the important potential of educational technology in increasing students' knowledge and motivation in this field. This finding provides strong support for future research and practice in aesthetic education.

RESULT ANALYSIS AND DISCUSSION

Experimental Verification of University's Ecological Aesthetic Interactive Teaching Platform Based on the Kruskal Algorithm

After analyzing the distinct features and differentiation of ecological aesthetic education courses and setting corresponding thresholds, the actual teaching experiment data of students in different universities were inputted into the error judgment function system according to the multi-cycle intelligent analysis model using the Kruskal algorithm. This process enabled the assessment of the teaching reliability and stability of the interactive teaching platform. Therefore, the interactive teaching platform dataset and traditional teaching platform dataset were taken as the experimental group and control group, respectively, in this study. The resulting interactive teaching analysis output image, generated through the error judgment function system based on the Kruskal algorithm, is shown in Figure 3. The experimental analysis of both the interactive teaching platform dataset and traditional teaching platform dataset shows that different types of teaching methods correspond to varying levels of classroom accuracy and student mastery effects. Additionally, as the number of cycles increases, students' satisfaction of their mastery effect improves. This is because of the university ecological aesthetic interactive teaching platform based on the Kruskal algorithm, which intelligently classifies and matches the value of ecological aesthetic education based on individual student learning characteristics and engagement levels during interaction. By analyzing the teaching status data of different students and consolidating them into one piece, the platform can determine final accuracy and stability. As a result, its effectiveness is superior to the traditional ecological aesthetic education methods.

Figure 3. Analysis image of experimental results



Analysis of Experimental Results

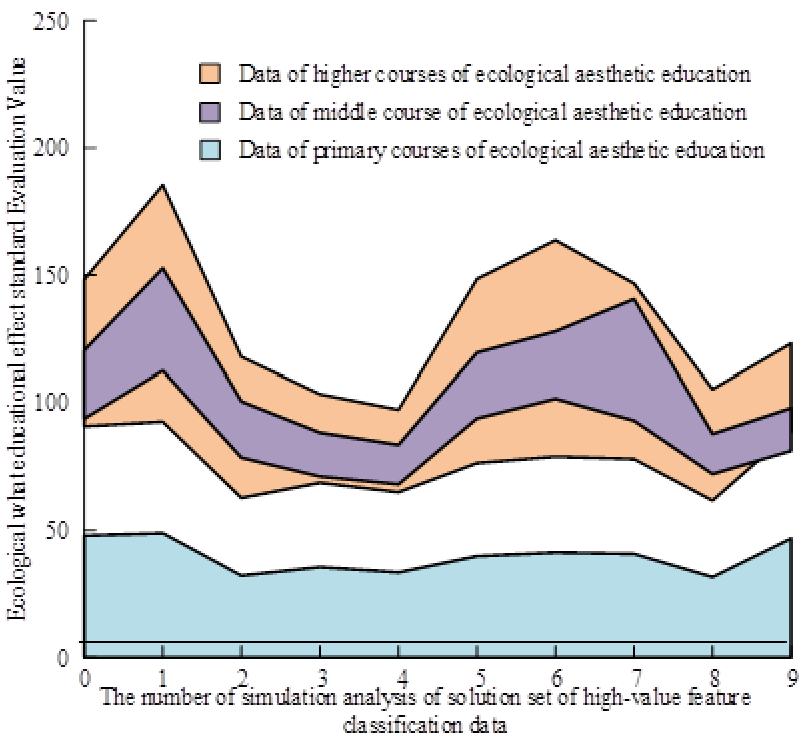
Through the classification and multi-value analysis of different experimental datasets, it is evident that the stability of the system continuously improves with the increase in the number of cycles. The corresponding error analysis results of the experimental data are shown in Figure 4. The results depicted in Figures 6 and 7 illustrate an improvement in the stability of the experimental data corresponding to the university's ecological aesthetic interactive teaching platform of based on the Kruskal algorithm. The error values under the unified criteria are small. This improvement is because of the high data relevance of the Kruskal algorithm for different types of students engaged in various interactive teaching processes. In addition, in the interactive teaching process, the Kruskal algorithm is used to analyze learners' behavior data, enabling the adoption of corresponding teaching strategies based on the analysis results, thereby effectively improving the teaching effect.

Therefore, the experimental results show that the interactive teaching platform for ecological aesthetics in universities, based on the Kruskal algorithm in this article, offers several benefits. First, it facilitates timely adjustment of teaching strategies for different types of students through data analysis results and classroom observations in the teaching process. Second, in the process of interactive learning process, students can effectively consolidate their ecological aesthetic knowledge and self-regulate through online data analysis results. Therefore, this interactive teaching platform has good reliability and stability.

According to the analysis of students' demands, attention should be given to several key aspects in ecological aesthetics education for college students.

First, there is a need to expand the coverage of ecological aesthetics and related courses in universities. Due to the current distinction between comprehension and professionalism in Chinese universities, there are differences in the degree of correlation between students' majors and ecological aesthetics, resulting in significant expectations for learning ecological aesthetics courses

Figure 4. Error analysis of experimental results



among students. Second, adopting a teaching approach that combines classroom instruction with extracurricular practice can enhance the fun and practicality of the course. Third, it is essential to establish a diverse curriculum evaluation system. It is suggested that the assessment method for ecological aesthetics courses involve extracurricular practical results reporting, with an emphasis on strengthening the evaluation proportion of practical components.

CONCLUSION

Addressing the challenges of limited student interaction and teacher participation in existing ecological aesthetic education methods, this article explores a novel approach centered around the interactive teaching platform in colleges and universities. The objective is to enhance college students' ecological aesthetic consciousness and explore a new method suitable to their ecological aesthetic emotional experience. The study investigates the application of an interactive instructional Gauss classification model based on the Kruskal algorithm in ecological aesthetic education.

First, the research status of interactive teaching platform design and interactive data analysis, both at home and abroad, is summarized. Second, the online ecological aesthetic education adaptive Gauss classification model based on the Kruskal algorithm is constructed. The "Gauss-Kruskal" equation method is adopted to build the ecological aesthetic interactive education platform within the IoT. Finally, practice tests are carried out to assess the error rate and adaptability of the online interactive teaching model based on the Kruskal algorithm. The results are analyzed to draw a conclusion.

When using an interactive platform for ecological and aesthetic education courses, students in the experimental group showed significantly higher motivation than those in the control group. This increased motivation was evident in active participation in online discussions, increased engagement with course materials, and a greater willingness to explore topics related to ecological aesthetic education. Statistical analysis confirmed the significance of this improvement in motivation, indicating an overall boost in engagement and interest in the subject matter.

The experimental results suggest that the integration of ecological aesthetic education theory and methods into the interactive teaching platform based on the Kruskal algorithm achieves the combination of traditional classroom instruction with ecological aesthetic education. This approach gives full play to the main role of students in the classroom, fostering their initiative and active engagement in learning. However, given the short duration of this study, the applicability of the proposed approach may have certain limitations. Further research can be carried out from the aspects of research objects and research period.

DATA AVAILABILITY

The figures used to support the findings of this study are included in the article.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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APPENDIX

The Kruskal algorithm carries out multiple intelligent trainings on different ecological aesthetic education data according to existing modes and rules. By using the multi-dimensional and self-cycling calculus method, the interactive teaching platform can instantly evaluate students' effectiveness in responding to various ecological aesthetic concepts. This includes assessing whether students have completed corresponding aesthetic assignments and homework. Furthermore, the network examination mode within the interactive teaching platform enables teachers to gauge students' real-time understanding of the content.

As the interactive teaching model of ecological aesthetic education in colleges and universities based on the Kruskal algorithm undergoes cycles of refinement, the threshold settings of multiple modules within the interactive teaching platform are generated based on the needs of ecological aesthetic teaching. The threshold derivative $A^{'}(a)$ of different cycles is:

$$A^{'}(a) = \frac{\sqrt{a^{a} + \frac{a^{-a}}{1 + a^{a}}}}{2a + a^{a}} \tag{1}$$

We carry out difference processing on the threshold derivative of the first batch of cycles to obtain the corresponding derivative of the second initial threshold:

$$A^{"}(a) = \beta \frac{\frac{a^{-a}}{1 + a^{a}}}{2 + a^{a}} + \frac{\sqrt{a^{a-1} + \frac{2a^{1-a}}{1 + a^{a}}}}{2a + a^{a}} \tag{2}$$

a is the course data of the interactive teaching platform in ecological aesthetic education. β is the threshold setting coefficient. By combining the data set information corresponding to different ecological aesthetic education with the standard equation, the judgment function can be obtained:

$$B\left(a\right) = \frac{\beta^{a}}{\beta + 1} \cdot \frac{a^{-a}}{1 + a^{a}} + \frac{a + \beta^{2} a^{3}}{\beta^{2} + (a-1)^{3}} \tag{3}$$

where β is the threshold setting coefficient. The corresponding standard value is:

$$B\left(a_{0} + a\right) = \sqrt{a_{0} + ae^{\beta\left(a-\beta\right)}} \tag{4}$$

Corresponding to different ecological aesthetic education methods, the descriptive condition function is:

$$C\left(a\right) = \sqrt{\frac{a\lambda^{a}}{a\lambda + 1} + \frac{\beta^{2} + a^{\beta}}{a\beta^{2} + (a-1)^{\beta}}} \tag{5}$$

where λ is the setting condition coefficient and β is the threshold setting coefficient. Next, we conduct an in-depth analysis. If:

$$\frac{a\lambda^{a}}{a\lambda+1}\leq 1+\frac{\beta^{2}+a^{\beta}}{a\beta^{2}+(a-1)^{\beta}} \tag{6}$$

then:

$$\frac{A(a)+\lambda^{a}}{B(a)\lambda+a}\leq 1+C(a)\frac{\beta^{2}+a^{\beta}}{a\beta^{2}+(a-1)^{\beta}} \tag{7}$$

The equivalent form is:

$$\frac{A(\beta a)+\lambda^{a}}{B(\lambda a)\lambda+a}\leq 1+C(\beta a)\frac{\lambda^{2}+a^{\beta}}{a(a-1)^{\beta+\lambda}} \tag{8}$$

Equation (8) is the basic condition characteristics of solving different types of data sets. The evaluation function of ecological aesthetic education is as follows:

$$D\left(a,\beta\lambda\right)=\sqrt{\frac{1+\left(1-a\lambda\beta_{a}\right)a^{\lambda+\beta}}{\sum_{i=0}^{k-1}\left(a_{i}+a\lambda\beta_{i}\right)a^{i}}} \tag{9}$$

At this point, the data set of the interactive teaching platform corresponding to ecological aesthetic education should meet the following conditions:

$$\left|\frac{\beta a_{k}-a_{k-1}}{\beta a_{k-1}-a_{k-2}}\right|<1,s=1,2,\cdots k \tag{10}$$

Interactive Ecological Aesthetic Education Platform in Universities: The Kruskal Algorithm Approach

This study aims to remove initial state information from the Kruskal algorithm.

First, considering the initial value challenge faced by teachers in ecological aesthetic education, it is necessary to determine the initial dataset for students and obtain an effective value-added function:

$$D\left(a\right)=\frac{\beta^{2}+a^{\beta}}{a\beta^{2}+(a-1)^{\beta}}+a\beta^{2} \tag{11}$$

When the value-added function is replaced under the condition of a threshold function, the replacement threshold function can be obtained:

$$D'\left(a\right)=\frac{\sqrt{\frac{\lambda\beta^{2}+a^{\beta}}{a\beta^{2}+(\lambda a-1)^{\beta}}}}{a\beta^{2}+\lambda}+\frac{a\beta^{2}}{\lambda+1} \tag{12}$$

The clustering threshold function can be obtained through interactive clustering:

$$E\left(a\right)=\sqrt{\frac{\lambda a-\beta}{a\beta^{2}+\lambda}+\frac{\beta^{2}}{\lambda\beta+a}} \tag{13}$$

The clustering threshold function is the optimal solution based on the Kloskar algorithm. The simulation results in the interactive teaching platform are shown in Figure 5. This study combines a distributed multidimensional dataset analysis method based on the Kruskal algorithm. Multidimensional analysis can perform analysis operations like slicing, scrolling up, drilling down, and rotating multidimensional data, facilitating observation and comparison from multiple perspectives to gain a deeper understanding of the information and connotations within the data. By grouping different ecological aesthetic education data, a solution set of high-value feature classification data was constructed based on random data. Its efficacy was verified through three sets of existing real data. The simulation results are shown in Figure 6.

After introducing the strategy analysis of the interactive teaching platform based on the Kruskal algorithm and adding the threshold function, the feature analysis results of the interactive teaching platform of ecological aesthetic education are shown in Figure 7.

The simulation results depicted in Figures 3, 4, and 5 show that through the ecological aesthetic teaching method of this interactive teaching platform, each student can actively invest in classroom activity, effectively improving the aesthetic education effect. This is because the use of the Kruskal algorithm within the interactive classroom promotes understanding and mastery of knowledge.

Figure 5. Simulation results in the interactive teaching platform

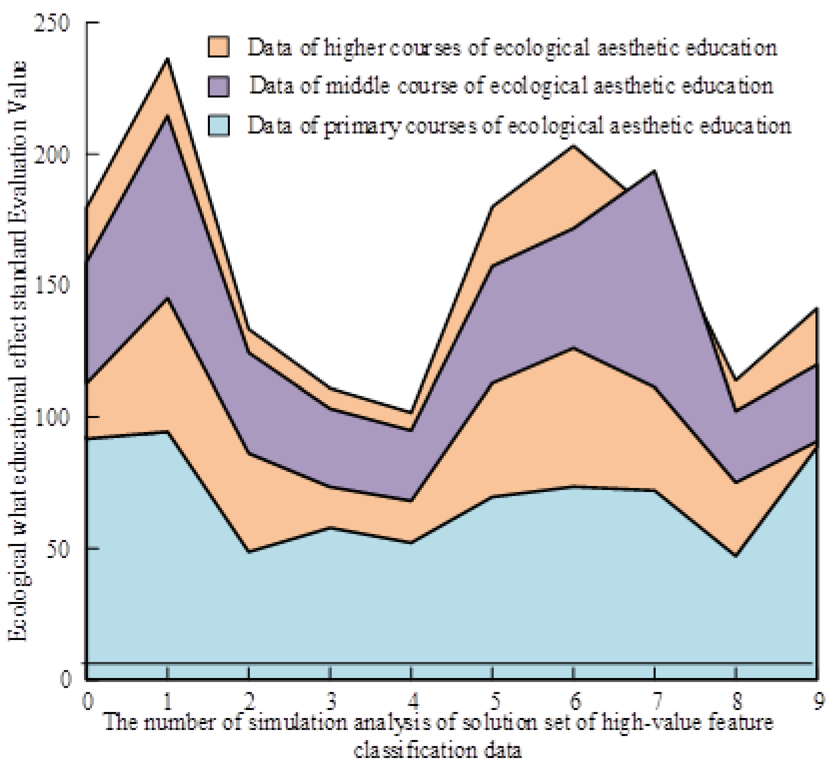


Figure 6. Simulation results of high-value feature classification data solution sets based on random data

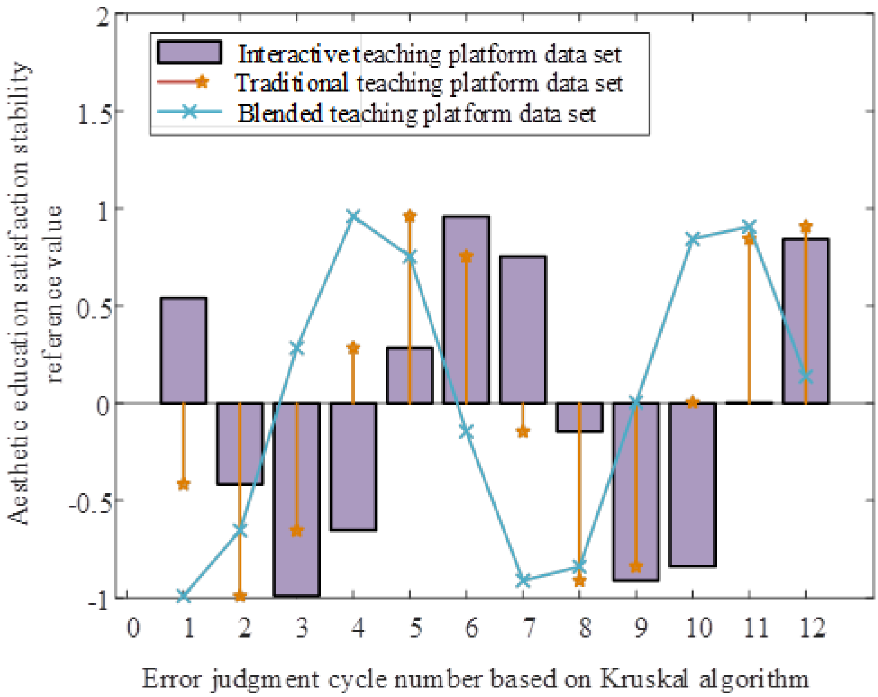
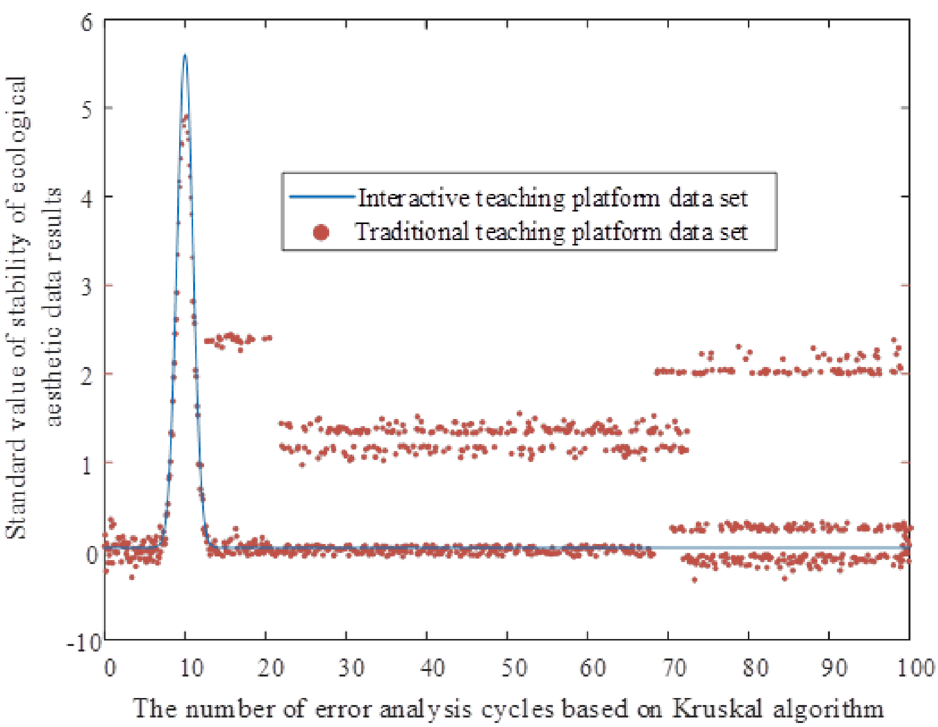


Figure 7. Random test simulation on three sets of data



Moreover, students summarize the ecological aesthetic knowledge they have learned during class, realizing the closed-loop aesthetic education.

Therefore, this study combines different types of error degree function sets to obtain a comprehensive threshold error function:

$$F\left(a\right)=1-\frac{\partial}{\beta+\lambda}\sqrt{\frac{\lambda a-A\left(a\right)}{a\beta^{2}+B\left(a\right)}+\frac{C\left(a\right)\beta^{2}}{\lambda\beta+D\left(a\right)}} \tag{14}$$

By normalized decomposition:

$$F'\left(a\right)=1+\frac{\frac{\partial}{\beta+\lambda}+\sqrt{\frac{\lambda a-A\left(a\right)}{a\beta^{2}+B\left(a\right)}+\frac{C\left(a\right)\beta^{2}}{\lambda\beta+D\left(a\right)}}}{\beta+\lambda+\partial+a} \tag{15}$$

∂ is the absolute reference value of error degree.

Nada Dabbagh is a professor in the Division of Learning Technologies at the College of Education and Human Development, George Mason University. She is a distinguished scholar in the field of educational technology and has contributed extensively to research related to online learning, mobile learning, and instructional design. Her research focus is centered on the application of technology in education, with a particular emphasis on the use of interactive teaching methods to enhance students' learning experience.