



Research on the Design of an Interactive Platform for Dance Teaching Based on Computer Algorithms

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Abstract. In this paper, we focus on the adjacency method and its improvement algorithm, Cass algorithm and its improvement algorithm, algorithm to calculate the distance between trees and the distance between networks, and build a visualization platform to integrate the above algorithms together, as to meet the user's needs in several aspects of the construction of system trees and phylogenetic networks. This paper analyzes a secondary school dance teaching example based on the theory of "four-stage teaching method", which enriches the teaching content and explores the depth of knowledge by constructing knowledge links and using multimedia-assisted teaching; it adopts a combination of words, paintings and dances to refine the action elements and broaden the latitude of knowledge; it integrates the commonality of "four-stage teaching method" with the characteristics of dance, and explores a new method of secondary school dance teaching from the perspective of improving teaching efficiency and enhancing students' learning quality, so as to make the teaching interlocked and guide students to help each other teach and express their emotions freely, so as to apply what they have learned.

Keywords: Adjacent method and its improvement algorithm · Four Segment Teaching Method · Secondary School Dance Teaching · Instructional Design

1 Introduction

Phylogenetics is a science that studies the evolutionary relationships of species, in which the construction of phylogenetic trees, the construction of phylogenetic networks, and the calculation of distances between phylogenetic networks are all important research directions in phylogenetics. However, so far, there is no platform that can effectively integrate these algorithms, resulting in researchers often needing to use multiple software when constructing trees or networks, which consumes a lot of time and effort [1].

2 System Tree Construction Algorithm

In this paper, we present an improved algorithm mainly for the adjacency method, and we will describe the implementation process of the adjacency method in detail [2] and the star-shaped evolutionary tree is decomposed by continuously merging such taxonomic units until an evolutionary tree with a tree structure is obtained [3], as shown in Fig. 1.

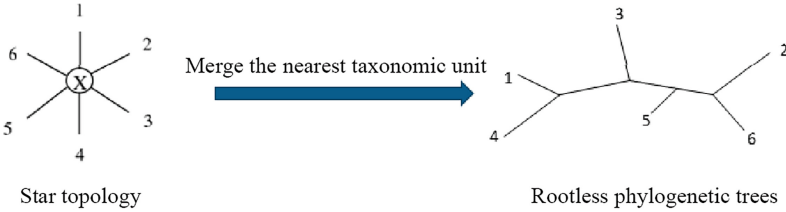


Fig. 1. Construction of system tree by adjacency method

The n classification units form the cluster set Y , and the distance matrix from Y D_{n-n} calculate and matrix S_{n-n} , and each item in the matrix S_{ij} represents the sum of branch lengths between nodes i and j , which is solved by the formula [4]:

$$S_{ij} = (n - 2)D_{ij} - R_j - R_i, 0 \leq i \neq j \leq n$$

Among them:

$$R_i = \sum_{k=0}^n D_{ik}$$

If the smallest value in the sum matrix is S_{pq} then merge p and q into a new classification unit m , and then update the distance matrix, the set of clusters Y after removing p and q Y' , i indicates Y' in a particular taxonomic unit, the distance between the new taxonomic unit m and the old taxonomic unit i is calculated by the formula:

$$D_{im} = \frac{1}{2}(D_{pi} + D_{qi} - D_{pq}), (i \neq p, q)$$

After merging p, q into m , the branch length of each branch in m needs to be calculated by the following formula:

$$L_{mp} = \left[\frac{1}{2(n - 2)}(n - 2)D_{pq} + R_p - R_q \right]$$

$$L_{mq} = \left[\frac{1}{2(n - 2)}(n - 2)D_{pq} + R_q - R_p \right]$$

The flow of the adjacency method is shown in Algorithm 1.

3 Teaching Design of Secondary School Dance Based on the Theory of “Four-Stage Teaching Method”

The teaching content in order to achieve the following common goals: (1) mastering new knowledge; (2) connecting old and new knowledge; (3) forming a knowledge system; and (4) applying the knowledge (Fig. 2).

This instructional design provides students with more opportunities for independent learning and thinking, while enhancing the unpredictability of their questions [5].

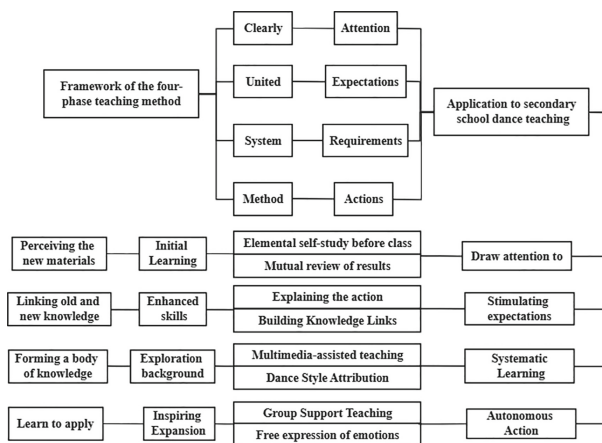


Fig. 2. Framework diagram of the four-stage teaching method

3.1 Analysis of the Learning Situation

This semester’s teaching content is the dance work “Qin Yuan Chun - Snow” by the Art Troupe of the Affiliated High School of Renmin University of China, which is based on the composition background of Comrade Mao Zedong’s words “Qin Yuan Chun - Snow” and praises the majesty and dolorousness of the motherland’s mountains and rivers and the heroic aspirants of the revolution in the form of dance [6] (Figs. 3 and 4).

The study of the dance “Qin Yuan Chun - Snow” will be designed on three levels: professional skills, knowledge expansion [7], and emotional enrichment, laying a solid foundation for future 9th grade language classes [8].

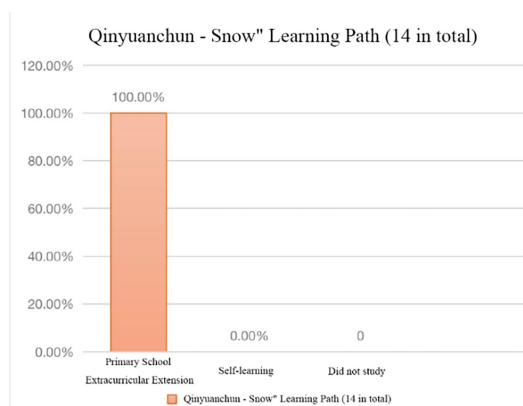


Fig. 3. Analysis of the learning path of the word “Qin Yuan Chun - Snow”

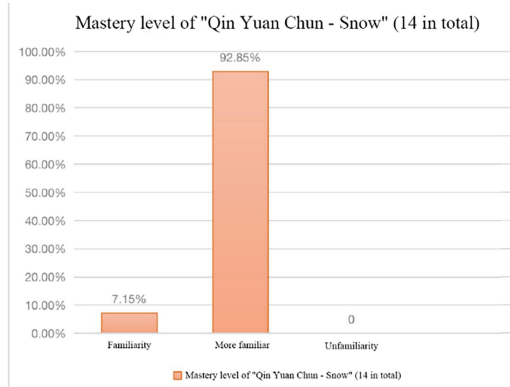


Fig. 4. Data on the mastery level of the word “Qin Yuan Chun - Snow”

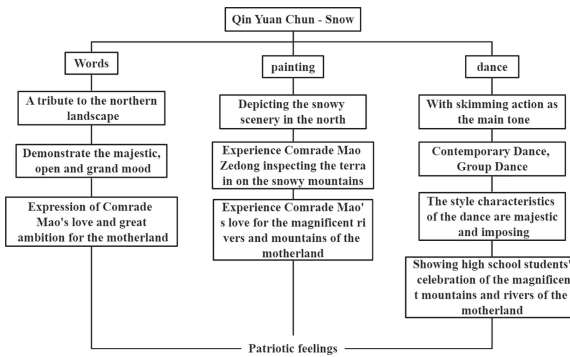


Fig. 5. Summary of knowledge of “Qin Yuan Chun - Snow”

3.2 Systematic Learning and Exploration of Dance Culture

In building the knowledge system [9], students’ logical thinking is trained, which is conducive to the development of students’ thinking, learning transfer ability, enhancing students’ motivation to learn, and enabling them to find learning rules from it [10].

- (1) Multimedia-assisted teaching, feel the mood of the dance;
- (2) Dance style attribution, in-depth dance background (Fig. 5).

4 Conclusion

All the phylogenetic algorithms involved in this study are presented in this paper, including INJ algorithm and ENJ algorithm for constructing phylogenetic trees; LNetwork algorithm, BIMLR algorithm, Frin algorithm for constructing phylogenetic networks; cluster algorithm, splitting algorithm, equivalence algorithm, triplet algorithm for calculating phylogenetic tree distances; equivalence algorithm, semi-equivalence algorithm,

vector algorithm, triplet splitting algorithm for calculating phylogenetic network distances. Each of these algorithms has its own advantages and disadvantages. The algorithms for constructing trees and networks improve on the adjacency method and Cass algorithm, respectively, and further enhance the computational speed, which are integrated in this paper in the software described below for ease of use. The significance of pedagogical use is to promote the development of teachers and the growth of students.

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