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Examining the Synergy of Bubble Maps and Double Bubble Maps for Enhanced Educational Visualization

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Abstract

This research explores the utilization of cognitive visualization aids in the realm of education, specifically focusing on Bubble Maps and Double Bubble Maps. While Bubble Maps are commonly employed for knowledge acquisition, Double Bubble Maps serve as effective tools for comparing similarities and differences within interconnected ideas. Previous studies have extensively examined the individual efficacy of these map types in educational settings. However, there is a noticeable gap in the literature concerning the combined use of both map types. This study seeks to address this gap by integrating the attributes of instructional courses and presenting educational information through a combined approach of Bubble Maps and Double Bubble Maps. The primary objective is to enhance students' learning efficiency, thus contributing to the advancement of effective teaching and learning practices.

Keywords: Bubble Map, Double Bubble Map, Teaching Strategies, Educational Visualization

Introduction

Background

Enhancing cognitive abilities through the utilization of visualization techniques during presentations proves to be an effective strategy. The concept of "Thought Visualization" was originally introduced by Liu and Lin (2019), Director of the Center for Thinking Visual Learning Experiments, and is now a theoretical framework employed by the Institute of Modern Technology at the East China Normal University. "Thought Visualization" entails using a series of visual representations to render previously imperceptible cognitive processes, such as thinking patterns and cognitive strategies, observable and comprehensible.

Thanking mapping, a cognitive tool was designed to facilitate learning processes (Hyerle, 1993). It is rooted in the examination of cognitive processes within the human brain and encompasses the cognitive patterns involved in problem-solving. Beyond aiding cognitive processes and making learning more accessible, thinking maps serve as visual aids in

knowledge construction, the promotion of critical thinking, and the enhancement of an individual's learning capacity (Nesbit & Adesope, 2006). The thinking map comprises eight distinct diagrammatic representations: circle maps, bubble maps, double bubble maps, flow maps, recursive process maps, tree maps, corner maps, and bridge maps.

The application of these various diagrammatic representations effectively addresses issues encountered in both educational and real-world contexts. This technique simplifies the establishment of comprehensive knowledge frameworks while concurrently fostering the development of essential skills like critical thinking, logical reasoning, and systems thinking, among other cognitive abilities. The circular map facilitates cognitive dispersion, aiding individuals in constructing knowledge networks relevant to thematic features and enhancing interconnections across various knowledge domains (Pan et al., 2023). The bubble map, as a method for conceptual interpretation, employs bubbles to both comprehend and visually represent the constituent elements of an idea, thereby conveying the conceptual structure of the information.

Despite the wide range of potential applications for the eight thinking tools, existing academic research and associated publications have not extensively explored practical implementations of these tools in the classroom. Previous academic investigations have primarily focused on individual maps and their utility within educational contexts, largely neglecting the exploration of using various combinations of diagrams (Bond et al., 2020). Additionally, previous research has examined the differences and similarities between two distinct teaching strategies, specifically the application of bubble maps and double bubble maps in various classroom scenarios (Radianti et al., 2020). However, no academic study has investigated the integration of these two methodologies.

This study aims to incorporate curriculum elements into instructional methods that align with these characteristics. Specifically, the use of bubble maps and double bubble maps will be implemented to enhance the presentation of educational material, resulting in increased information retention among students.

Methodology

Bubble maps are frequently utilized to elucidate items or concepts, finding particular utility in educational contexts for explicating the constituent elements of concepts and their related entities (Su, 2017). Moreover, they are commonly employed to illustrate relationships between objects or concepts.

In the context of a bubble map, the central circle houses the main topic, facilitating a clearer comprehension of the theme. Furthermore, it allows for the incorporation of creative elements by placing the topic within the central circle and enumerating associated aspects in the peripheral circle, thereby enhancing the understanding of the central idea.

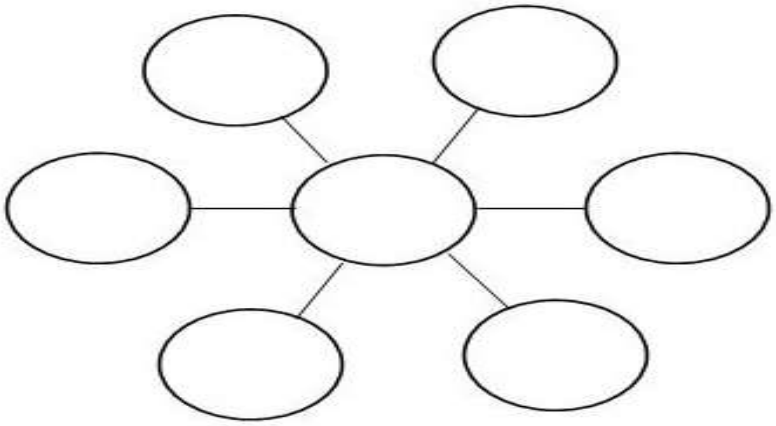

Figure 2.1 Bubble map

When undertaking a comparative analysis of two ideas, the double bubble diagram proves to be a valuable tool. This diagram employs a structured format comprising two circles, with each circle representing a distinct idea. Within these circles, various elements and facets associated with the respective ideas are delineated (Zhao, 2022).

To conduct a comparative analysis using this tool, it is necessary to select two distinct ideas or principles as the subjects of examination. These ideas are depicted using two central circles as symbols. The section of the central circle that overlaps with the other two circles symbolizes the qualities or aspects shared by the two different ideas. On either side of the central circle, the areas not occupied by the overlap represent the unique qualities or characteristics associated with each individual notion (Zhou, 2019).

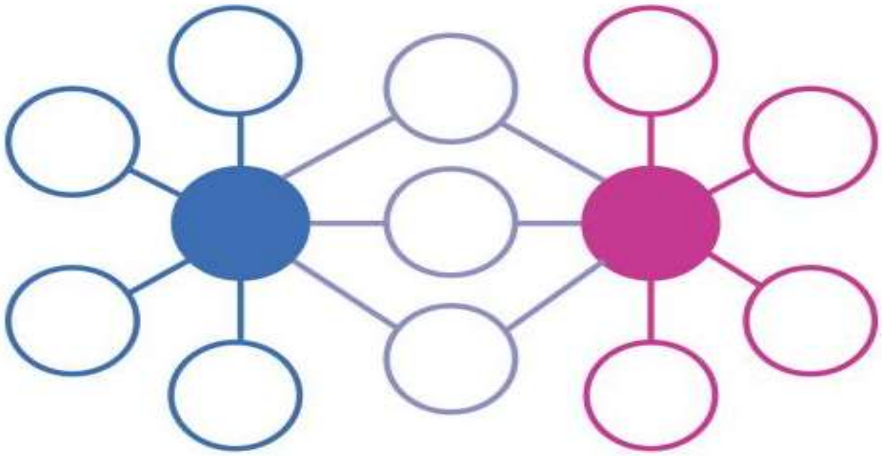

Figure 2.1 Bubble map

Both bubble maps and double bubble maps are valuable visualization techniques that simplify the comprehension of cognitive processes (McGrath & Willcutt, 2022). By employing these diagrammatic representations, one can condense extensive textual content into simplified maps containing only essential elements. This not only enhances comprehension but also aids in better retention of the material.

Throughout the learning process, both bubble maps and double bubble maps are employed. During the initial phase of the study, students engage in the acquisition of new ideas. They use bubble maps to comprehend individual concepts and double bubble maps to draw comparisons between previously acquired concepts and newly introduced ones. This phase

encourages students to actively construct their cognitive frameworks for learning, facilitating the integration of past and present material through the use of bubble maps and double bubble maps (Tian et al., 2019).

Educators play a crucial role in enhancing the bubble and double bubble maps created by students during the instructional phase. This involves rectifying any errors and augmenting the maps with additional information, enabling the integration of new knowledge and fostering a deeper, more comprehensive grasp of the topics represented in the maps. After the educational session concludes, students receive constructive feedback to further improve their comprehension and map creation skills.

By maintaining systematic documentation, it becomes possible to investigate the significance of incorporating bubble and double bubble maps in educational instruction. Additionally, one can assess the time students require to create these visual representations, evaluate the accuracy of the depicted branches, and determine the duration needed for map creation.

As a case study, the course "Career Planning and Entrepreneurship Guidance for College Students" will be utilized, focusing on the first part of Chapter 2, "Career Planning." This section elucidates career planning, encompassing the concept of a career, the process of career planning, its significance, and the myriad factors influencing career planning across four major aspects. To equip students with a foundational understanding, pre-study assignments are recommended before the session commences. After an in-depth study of the textbook content, students can comprehend the various facets of a profession. This comprehension can be realized through the creation of two bubble maps—one outlining traits associated with a specific career and the other delineating the stages of a professional journey. Additionally, two distinct bubble maps describing the steps in the career planning process should be based on textbook information.

Two commonly used visual representations in career development are the bubble map for career planning and the bubble map for career specification, both of which fall under the category of bubble maps. During instructional sessions, the teacher can evaluate and provide feedback on the students' preparation assignments by selecting and showcasing examples of their work. Moreover, the instructor can offer guidance and assistance as students revise their bubble maps during presentations.

Following the introductory phase, students can create a double bubble diagram to compare and contrast the concepts of career planning and vocational career planning. This comparative exercise, conducted with classroom engagement in mind, fosters a deeper understanding of the two concepts, ultimately improving comprehension of career and vocational career planning. This enhanced understanding better equips students to engage with subsequent chapters, including those covering the fundamentals and steps of career planning, the development of a career plan book, and its two divisions. The creation of these divisions within the career planning book serves as a foundational structure for subsequent chapters, enabling a comprehensive examination of various career concepts. This review includes the bubble map presented in earlier training sessions to elucidate various career planning ideas.

To produce an outstanding book on career planning, a comprehensive understanding of the concept is essential. The incorporation of two cognitive visualization tools, the bubble map and the double bubble map, empowers educators to enhance their instructional effectiveness and facilitates deeper comprehension of subjects among students.

Discussion

Analysis of the Effects of Application

Analyzing, synthesizing, generalizing, abstracting, comparing, concretizing, and systematizing represent various cognitive processes. These processes play a pivotal role in transforming perceptual inputs into coherent and rational information, ultimately facilitating problem-solving. According to Rahman (2019), concepts, evaluations, and lines of reasoning are fundamental components of cognitive processes. Thought capacity is not only vital for students' educational endeavors but also essential for human inventions and creative endeavors. It forms the bedrock of an individual's overall learning capability.

In recent years, the development of students' critical thinking skills has gained increased attention due to the demands of modern society. Fostering critical thinking abilities holds paramount significance within the framework of everyday classroom instruction. Cultivating students' cognitive capacities is crucial for supporting creativity and entrepreneurship across various domains of life (Shu et al., 2020).

Research has demonstrated that the utilization of bubble maps and double bubble maps in educational contexts facilitates the creation of comprehensive knowledge frameworks for students (Almulla & Alamri, 2021). This applies to both single and double bubble map formats. The educational process involves conceptualizing knowledge in a visual format, such as a bubble map or double bubble map, where interconnected concepts can be represented by bubbles. This method not only simplifies the acquisition of new knowledge but also contributes, both positively and negatively, to the integration of past and present knowledge, thereby enhancing the learning process.

The construction of a knowledge system aids in the development of students' capacities for divergent and associative thinking. This process enables the uninterrupted flow of knowledge from one point to another and facilitates the creation of connections between various knowledge points, resulting in the formation of a cohesive and meaningful knowledge network. Subdividing knowledge items and establishing links between them through bubble maps and double bubble maps significantly contributes to the generalization of information. Meaningful connections between various knowledge points can be recognized and established by meticulously organizing and categorizing both the knowledge points themselves and the associated information within these visual representations (Dong et al., 2021). This method fosters deeper comprehension and the integration of diverse information points.

Studies have shown that the utilization of a range of 7±2 blocks (Miller, 1956), especially when coupled with previously learned information related to the blocks, significantly aids the process of memorizing knowledge points. This particular range exhibits the highest efficiency in terms of memorization. Using bubble maps and double bubble maps in the classroom has proven to be more effective in enhancing students' ability to remember and memorize information compared to conventional rote memorization methods, which are often less engaging for students. These visual representations facilitate the transition of written information into visual formats.

Bubble maps and double bubble maps are typically used at various stages of the learning process, including pre-study, explanation, and review. They not only enhance students' capacity to acquire knowledge but also improve their logical reasoning abilities. These tools are integral to the closed-loop learning process and serve as effective teaching aids, promoting students' knowledge acquisition.

Research in educational settings has consistently shown that the use of bubble maps and double bubble maps enhances instructional effectiveness, improves students' comprehension of knowledge, optimizes their logical reasoning abilities, and facilitates the construction of comprehensive knowledge frameworks.

Conclusion

The application of bubble maps and double bubble maps within educational contexts proved to be a potent method for enhancing students' comprehension, retention, and critical thinking skills. These visual tools not only facilitated the development of comprehensive knowledge frameworks but also supported divergent and associative thinking, allowing for meaningful connections between various concepts. Furthermore, their usage led to improved memorization and recall of information, surpassing traditional rote memorization techniques in terms of both engagement and effectiveness. Moreover, the study highlighted the pivotal role of these visualization techniques in enhancing instructional effectiveness, as educators could guide students in creating and refining their maps, offering constructive feedback, and deepening their grasp of the subject matter. In sum, this research emphasizes the value of integrating bubble maps and double bubble maps into educational instruction to optimize the learning process and foster cognitive growth among students.

Limitations and Contributions

While the research highlights the benefits of utilizing bubble maps and double bubble maps in educational contexts, it is essential to acknowledge certain limitations. The study primarily focuses on the advantages of these visual representations and does not delve deeply into potential challenges or drawbacks. Future research could explore any limitations or difficulties encountered in implementing these maps in diverse educational settings.

Meanwhile, this research makes several significant contributions to the field of education. Firstly, it sheds light on the practical utility of bubble maps and double bubble maps as cognitive visualization tools. By demonstrating their effectiveness in enhancing students' comprehension, retention, and critical thinking skills, the study offers educators valuable resources for improving instructional methods.

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References

Almulla, M. A., & Alamri, M. M. (2021). Using conceptual mapping for learning to affect students' motivation and academic achievement. *Sustainability*, *13*(7), 4029.

Bond, M., Buntins, K., Bedenlier, S., Zawacki-Richter, O., & Kerres, M. (2020). Mapping research in student engagement and educational technology in higher education: A systematic evidence map. *International journal of educational technology in higher education*, *17*(1), 1-30.

Dong, Y., Zhu, S., & Li, W. (2021). Promoting sustainable creativity: An empirical study on the application of mind mapping tools in graphic design education. *Sustainability*, *13*(10), 5373.

Hyerle, D. N. (1993). *Thinking maps as tools for multiple modes of understanding*. University of California, Berkeley.

Liu, Z., & Lin, S. (2019). Integration of thinking visualization and deep Learning. *Information Technology Education in China*, *21*, 5-8.

McGrath, M., & Willcutt, W. (2022). The creative use of Thinking Maps to embed Blooms' Taxonomy within teaching, learning and assessment. *Educatio: Jurnal Pendidikan STAIM Nganjuk*, *6*(4), 346-372.

Miller, G. A. (1956). The magical number seven, plus or minus two: Some limits on our capacity for processing information. *Psychological review*, *63*(2), 81.

Nesbit, J. C., & Adesope, O. O. (2006). Learning with concept and knowledge maps: A meta-analysis. *Review of educational research*, *76*(3), 413-448.

Pan, Q., Zhou, J., Yang, D., Shi, D., Wang, D., Chen, X., & Liu, J. (2023). Mapping Knowledge Domain Analysis in Deep Learning Research of Global Education. *Sustainability*, *15*(4), 3097.

Radianti, J., Majchrzak, T. A., Fromm, J., & Wohlgenannt, I. (2020). A systematic review of immersive virtual reality applications for higher education: Design elements, lessons learned, and research agenda. *Computers & Education*, *147*, 103778.

Rahman, M. M. (2019). 21st century skill'problem solving': Defining the concept. *Rahman, MM (2019). 21st Century Skill "Problem Solving": Defining the Concept. Asian Journal of Interdisciplinary Research*, *2*(1), 64-74.

Shu, Y., Ho, S.-J., & Huang, T.-C. (2020). The development of a sustainability-oriented creativity, innovation, and entrepreneurship education framework: a perspective study. *Frontiers in Psychology*, *11*, 1878.

Su, J. (2017). Skillfully grasping language training through "bubble map". *Primary School Teaching Reference*, *27*, 22-23.

Tian, F., Yue, J., Chao, K.-m., Qian, B., Shah, N., Li, L., Zhu, H., Chen, Y., Zeng, B., & Zheng, Q. (2019). Modeling e-Learners' Cognitive and Metacognitive Strategy in Comparative Question Solving. *arXiv preprint arXiv:1906.03074*.

Zhao, S. (2022). The application of thinking visualization tool "Double Bubble Diagram" in the teaching of ancient poetry in primary schools: A case study of the teaching of "Xier" and "Titlin 'an Di". *Fujian Basic Education Research*, *06*, 63-64.

Zhou, L. (2019). Application of double bubble chart in cultivating core literacy of high school students. *Middle School Mathematics*, *05*, 92-93.