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CONCEPT MAPPING: A TEACHING STRATEGY FOR UNDERGRADUATE SCIENCE STUDENTS

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Abstract

Constructivists believe that knowledge is the result of individual constructions of reality. It is through one's active construction, not someone else's presentation, that the learner comes to comprehend how the world functions. The assumptions are that all individuals are unique and that people's experiences are consistent with how they mentally view the universe. It might be difficult in some situations to change one's incorrect viewpoints and points of view.

Mind mapping is a valuable technique for teaching and learning in undergraduate science education. It allows learners to construct their knowledge, making associations easily and aiding in recalling existing memories. By using mind maps, students can better understand complex topics such as genetics.

One of the advantages of mind mapping is that it encourages a brainstorming approach to various tasks. This is particularly helpful for science students who need to think creatively about how different concepts and processes are related. Additionally, mind maps can help students to organize and prioritize their ideas, which is useful when studying for examinations.

This paper focuses on the benefits of using mind maps for teaching and learning for undergraduate students of science. By allowing students to construct their knowledge, make associations easily, and think creatively, mind maps can help students better understand complex scientific concepts.

***Keywords**: Constructivist method, Science, Education, Mind map, Concept map, Genetics.*

INTRODUCTION

Constructivism is an epistemic perspective on knowledge acquisition that emphasizes creating knowledge rather than receiving knowledge from others or documenting their transmission of information. The construction and transformation of knowledge are acknowledged as the responsibility of the learner. There are various viewpoints within constructivism regarding the nature of knowledge and the creation of information.

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Constructivists believe that students actively build their information. According to Joseph D. Novak, "meaningful learning involves the assimilation of a new concept and proposition into existing cognitive structures," in the book "Learning how to learn."

Students frequently find the topic to be meaningful even after learning it, not because they lack intelligence, but rather because of how the human mind operates, which makes subjects as they are organized and taught meaningless to them.

Jean Piaget is credited with developing the mechanisms by which information is internalized by students and with developing the constructivism theory. People gain new information from their experiences through the processes of accommodation and assimilation. When people assimilate, they incorporate fresh information into an established framework without altering it.

When people's experiences match up with how they perceive the universe internally. In some circumstances, it might be impossible to alter one's inaccurate viewpoints and points of view.

The delayed recall of ideas acquired or observed events relies on both the initial experiences and the recalling person's cognitive makeup, attitudes, and interests. Both original learning and retention are facilitated by meaningful material and a meaningful rather than a rote approach to learning. The instructor should ensure that the learning strategy is meant to improve student retention of important information. A constructivist move in this direction is the use of mind maps. A good mental map makes it easier for the learner to make associations. They only contain primary ideas and are anchored to a single conceptual center.

Mind maps can be used for many different things, including note-taking, brainstorming, summarizing, revising, and general thought classification. People can listen to presentations and take notes using mind maps for the majority of keywords, mnemonic devices, or to organize a complex idea. Additionally, mind maps are marketed as a tool for coloring-pen creativity workshops.

Our curriculum, whether it be in higher education or schools, is heavily influenced by external examinations, and typically, students study under test pressure. Teachers also overwork their students, but effective instruction only happens when teachers engage their students in the material and inspire a passion for learning. So, when a science instructor chooses and applies a specific teaching strategy, they can concentrate on how and what students learn.

In the recent National Education policy 2020, constructivism has gained a lot of attention in education. It is a method that can facilitate meaningful teaching and learning in all disciplines. It offers suggestions for changing the method of teaching from traditional methods to new methods like concept mapping, mind mapping, meta-cognitive process strategy, etc.

Visualizing the relationships between various ideas is done through the use of concept mapping. In a downward branching hierarchical structure, the concepts are joined by labeled arrows and linking words are used to clarify how the concepts relate to one another. The constructivism movement, from which concept mapping emerged, promotes the idea that students actively create information. Similar methods include mind mapping, which is typically limited to radial hierarchies and tree layouts. In contrast to mind maps, which have branches that branch out from a central image, well-made concept maps develop within the context frame specified by a clear "focus question." Another difference between mind maps and contrast maps is speed and spontaneity. This is because a mind map represents your ideas on a single subject and can be used for group brainstorming. Accordingly, a concept map has more than a mind map with one primary concept.

In the fields of agricultural and medical sciences, as well as other applied sciences, genetics is an essential component. (Winchester,2018). Due to its complexity and abstract nature, genetics can be perceived as a challenging scientific subject to teach and understand by both teachers and students. (Kantahan et al., 2020; Osman et al., 2017; Etobro, Banjoko, 2017; Gusmalini, Wulandari, 2020). observed that 75% of pre-service Nigerian biology teachers who took part in their research had several misconceptions about genetics. The majority of research participants attributed the non-representational approach to teaching genetics concepts as the cause of these false beliefs. Finding new approaches that can improve the teaching and learning of genetics and related mechanisms is therefore essential.

Several studies, including those by Kargo, Hobbs, and Erickson in 1980 and Wood Robinson in 1994, have demonstrated that young people explain some elements of inheritance using their innate understanding even before receiving formal instruction in these topics. These concepts, which frequently diverge from those that need to be taught, might be the result of prior knowledge and shouldn't be taken into consideration by teachers when they plan and deliver lessons.

Numerous studies have revealed that even after instruction, students still have significant misconceptions about the fundamental scientific concepts relating to biological inheritance.

The present paper deals with mind maps in teaching-learning. Just like a Year plan, a Unit plan and lesson plan guide the work of a teacher in the class. Similarly, a teacher should use a mind map and encourages a brainstorming approach to the various task in the classroom. It is also recalling the existing memory in the classroom.

This study focussed on trying to find answers to a few questions.

- Will the students' level of achievement in the topic significantly differ if mind maps are used?
- Will the graduate students prepare their mind maps in learning genetics and Infectious diseases?
- What will be the opinion of students regarding the use of mind maps?

NULL HYPOTHESIS

There will be no significant difference in the student's achievement levels in their subject as a result of the use of mind maps in the course.

METHODOLOGY

Type: Action research

Design: A mixed-method approach was followed in the study.

- Programme development for teaching Genetics papers using mind maps.
- Experiment (single group design, pre-and post-tests).

Sampling:

All first-year B.Sc. students at Khaja Banda Nawaz University majored in zoology, and they were all taught the NEP2020 syllabus exam titled "CYTOLOGY, GENETICS, AND INFECTIOUS DISEASES."

The scope of the study focuses on the impact of using mind maps on the retention of students.

Aspects like interest, attitude, the span of attention, motivation, etc. of the students are beyond the control of the researcher, these are limitations of the study.

Delimitation: The research is limited to 50 first-year B.Sc. students at Khaja Banda Nawaz University.

Tools Used:

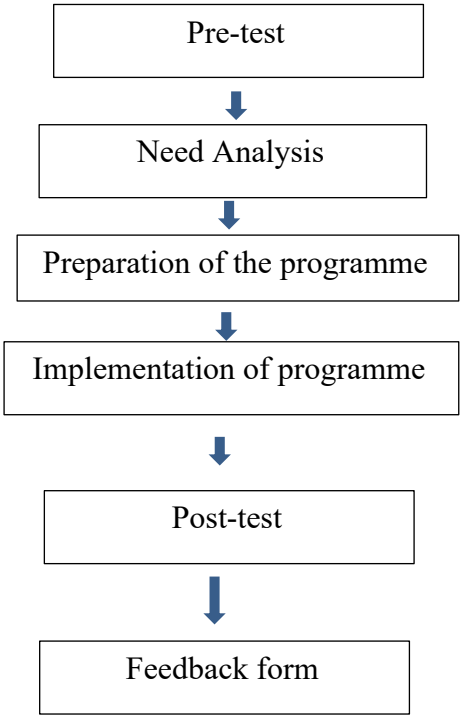
1. A lesson plan for each unit.
2. Mind maps for instructional modules
3. A need analysis worksheet
4. Questionnaire based on content [pre-test and post-test].
5. A feedback form for students to provide input on the programme.

Data Collection:

Preparation of programme of teaching with mind maps.

Lesson plans catered to the needs of different kinds of learners. A variety of teaching-learning aids, activity-centered teaching-learning, and use of mind maps which contained classified content matter, various colors, images, and pictures used to support the units.

Implementation Stages:



Feedback form from the Students:

Following the program's implementation, a post-test was administered, and the results were promptly followed by the distribution of feedback forms to each student. The response sheet was also analyzed.

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RESULTS AND DISCUSSION

Data Analysis

Comparison of the pre-test and post-test mean

Table 1.

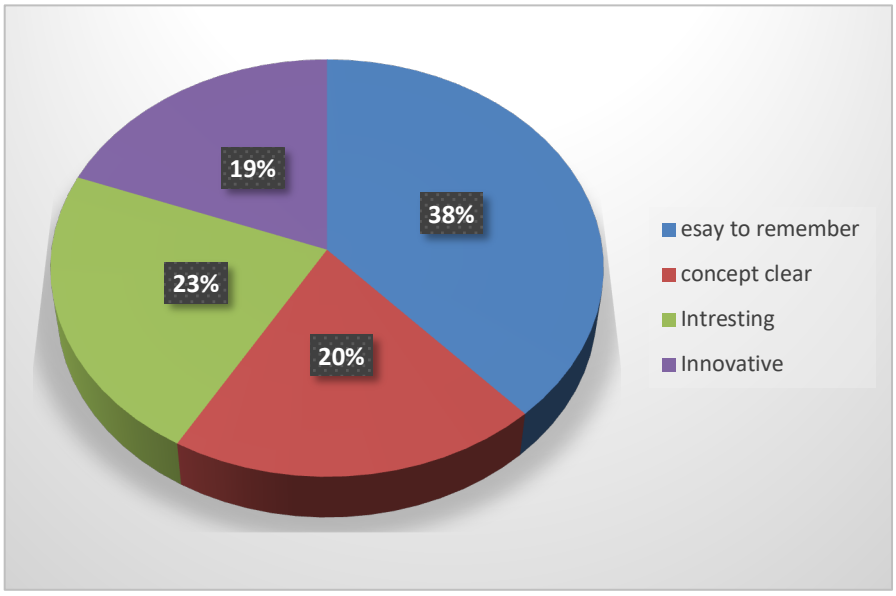
Comparison of the Pre-test and Post-test Mean Scores

Item	N	Mean score	SD	SE MEAN	OF SED	't' Value
PRE-TEST	50	6.43	1.05	0.23	0.72	4.20
POST-TEST	50	9.48	0.96	0.21		

Interpretation of the "t" Value must be 2.84 to be considered significant at the 0.01 level. The obtained "t" value of 4.20 is higher than 2.84 and can be considered as significant. Thus, the null hypothesis that "there is no significant difference in the achievement level of the students in the subject after implementation of the programme using a mind map is rejected."

Figure 1.

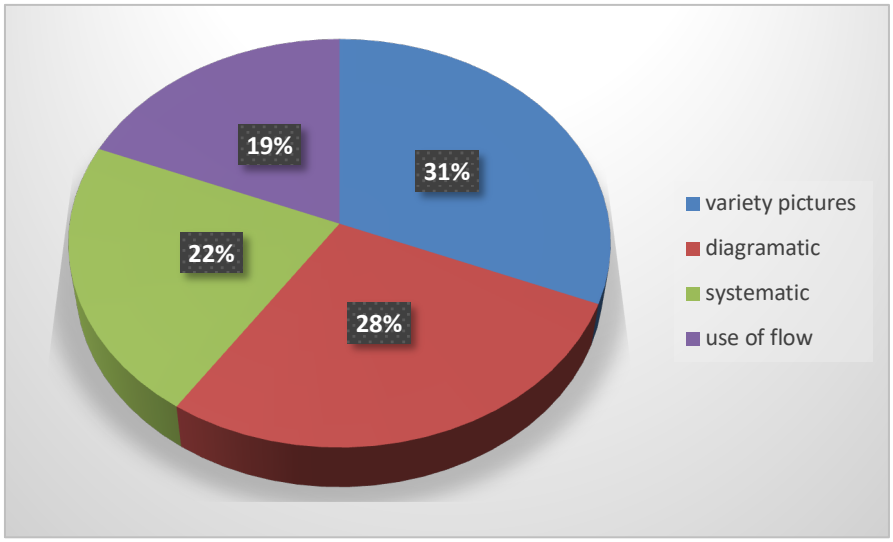
Features of Mind Map Appreciated by Students



The majority of the students opined that it was easy to remember. As the concepts were difficult to understand in online classes due to the pandemic. Other features appreciated by the students were the use of mind maps being interesting and innovative.

Figure 2.

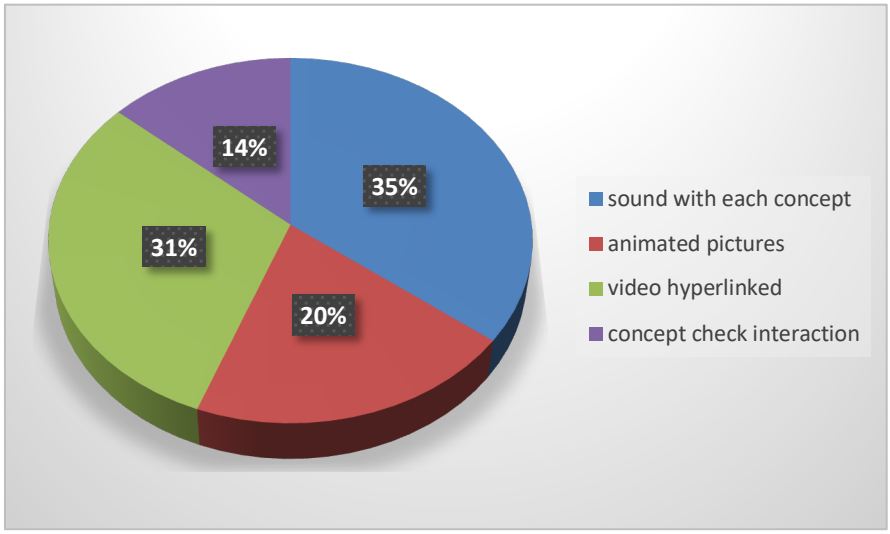
Features that Applied by the Respondents



Features use in mind maps that appealed to the respondents are pictorial presentation and diagrammatic representation were the most appealing features of the mind map. The other benefits were the use of flow charts and systematic representation. The use of visuals and video rather than words to communicate ideas is a successful method.

Figure 3.

Aspects that Could have Made the Lesson More Effective

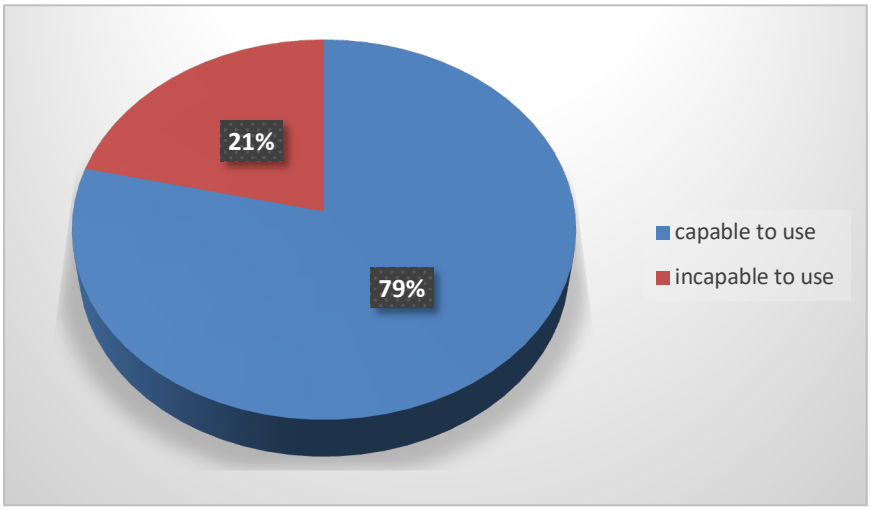


The majority of students believe that making the pictures audible would significantly increase the lesson's efficacy. The other is an animated film that's hyperlinked in mind maps, which makes genetics simple to comprehend. Concept check interaction sessions are also effective with respondents.

When visual and aural elements are combined, students find the instruction and learning process enjoyable.

Figure 4.

Percentage of Respondents who Use Mind Maps



Seventy-nine percentage of the respondents could prepare their mind maps. They used their ideas and experiences to prepare mind maps that they can easily conceptualize and retains in their memory. 21% of the students do not prepare their mind maps for the topic were the ones who found it difficult to draw the pictures and ideas that they had in their minds.

MAJOR FINDINGS

- The quantitative analysis shows that the programme prepared by the researcher for teaching the Genetics topic using mind maps was effective.
- The use of mind maps has improved learning retention and made learning more engaging and innovative.
- The visual presentation has helped many students to retain the subject matter in a better way.
- Students believe that adding sound effects to the pictorial display will improve not only retention but also memorization.

- Finding stress the importance of using suitable audio-visuals in certain topics enhanced their learning.
- The majority of the students have an impact of the concept maps on their learning. The researcher found that students were successfully using this concept not only in other units but also in other disciplines too.

The study's results are consistent with those of related studies, which demonstrate that genetics is a challenging topic to teach and that teachers' efforts and interest in the material they are teaching are important. The study emphasizes the significance of students' prior knowledge, expectations, and perception in deciding what material is selected for attention and what they learn. Students must employ cognitive processes to build the connections between the concept's informational components to learn a concept in a meaningful manner.

CONCLUSION

This action study has led to the conclusion that the student's prior knowledge, expectations, and perceptions are what matter. What material is chosen for focus? What they learn depends on what interests them. Students must use cognitive processes to build the relationships between the information elements in a concept to acquire it meaningfully.

According to the researcher, science teachers could be more successful if they could overcome scientific and developmental barriers. They advise teachers to tackle misconceptions and resistance in traditional education, as well as become acquainted with educational research and strategies that can assist in addressing these problems. Overall, the research provides useful insights into the use of mind maps in genetics teaching and emphasizes the significance of teachers' efforts and interest in fostering effective learning.

REFERENCES

Anderson, C.W. & Smith, E.L. (1987). Teaching science. In V. Richardson – Koehler (Ed.), Educators' Handbook: A Research Perspective (pp.84-111).

Aussbel, D. P. Novak, J.D. & Hanesian, H. (1978). Educational psychology: A Cognitive view (2nd ed.). New York: Holt, Rinechart, and Winston.

Buzan Tony and Buzan Barry. (2000) The Mind Map Book. London: BBC Worldwide Ltd.

Buch. M.B. Fourth Survey of Research in Education, Vol. I. N.C.E.R.T. New Delhi.

Dehghanzadeh, S., Jafaraghaee, F. (2018). Comparing the effects of traditional lecture and

flipped classroom on nursing students' critical thinking disposition: A quasi-experimental study. Nurse Education Today. 71: 151-156.

Etobro, A.B., Banjoko, S.O. (2017). Misconceptions of genetics concepts among pre-service teachers. Global Journal of Educational Research. 16(2): 121-128.

Gusmalini, A., Wulandari, S. (2020, October). Identification of misconceptions and causes of student misconceptions on genetics concept with CRI method. Journal of Physics: Conference Series. IOP Publishing. 1655(1): 012053.

Jaafarpour, M., Aazami, S., Mozafari, M. (2016). Does concept mapping enhance the learning outcome of nursing students? Nurse Education Today. 36: 129-132.

Mind mapping. 'How to make a Mind Map' Retrieved September 2011, from http://www.mindtools.com/pages/article/newISS_01.htm

Osman, E., BouJaoude, S., Hamdan, H. (2017). An investigation of Lebanese G7-12 students' misconceptions and difficulties in genetics and their genetics literacy. International Journal of Science and Mathematics Education. 15(7): 1257-1280.

Wikipedia. Mindmap. Retrieved August 17, 2011, from http//en.wikipedia.org/wiki/Mind_ map.

Winchester, A.M. (2018). Genetics. In Encyclopaedia Britannica. [Electronic resource]. URL: https://www.britannica.com/science/genetics.

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