

Learning lab: weaving mind maps and technology for teaching

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Abstract: Creative and innovative instructional material comprising aids and other learning support resources were vital considerations in order to proceed with effective and retentive teaching and learning process. This study assessed the effectiveness of digitalized mind maps as developed intervention material in teaching and learning process in science. It was participated by 300 randomly selected public secondary school teachers in the country and 30 purposively selected grade 10 students in a selected public secondary school. The use of survey-questionnaire and teacher-made-test served as the primary research instruments. As the study employed mixed method, it revealed that teachers had a higher level of acceptability in using digitalized mind maps in teaching subject areas. Also, the study showed there was a significant increase in the pretest and posttest scores of experimental group who was subjected in the use of digitalized mind maps in selected topics in science 10. Apparently, the study recommended to modify and contextualize the developed digitalized mind maps in order to cater diverse learners' needs and demands in the teaching and learning process.

Keywords: Learning, Mind maps, Technology, Increased, Performance, Digitalized, Teachers, Learners

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INTRODUCTION

Instructional materials are considered as support mechanisms of teachers in the delivery of effective and efficient instruction. The value of instructional materials lies heavily on their practical importance, relevance, creativity and innovation. In the 21st Century teaching and learning process, it is expected that teachers utilize relevant, creative and innovative instructional materials which are reflect learners' needs and demands. Also, under the teaching and learning

process, teachers find it difficult in developing their learners' academic performance because of lack of relevant and creative instructional materials. Teachers also find it difficult to create more comprehensive teaching and learning process where retention should have been emphasized because of lower level of engagement brought about by lesser motivation.

Consequently, development of creative and innovative instructional materials add greater engagement and efficiency in the provision of meaningful teaching and learning process. As shown in the study of Castillo and Montenegro (2025) reveals that creativity in the preparation of teaching materials and contents are needed to make it easier for student to follow comprehensive and retentive learning process. Meanwhile, in the words of Pattaufi et al. (2023), proper learning model supports an effective and efficient learning process. Thus, creative design and development of instructional material helped influenced positive learning. In addition, Nagaraj et al. (2020) reveals that innovative teaching and learning methodologies included outside the box teaching and learning tasks.

Further, the use of mind maps as creative teaching and learning material has been regarded as one of the most practical and highly impactful instructional materials for retention. In this line, mind maps are also used to represent connection of ideas and linking of information to convey significant concepts. In fact, based from the study of Gavens et al. (2022) shows that mind mapping is an effective instructional tool which create meaningful and retentive learning process. In this line, the study also show that there is a strong need to develop mind maps as instructional material.

To funnel this undertaking in, the researchers developed a digitalized mind maps where teachers used this developed mind maps based on the subjects they handled. In as far as this study is concerned, mind maps are developed to deliver basic and efficient instruction in Science.

Statement of the problem

This study assessed the effectiveness of the developed digitalized mind maps in the teaching and learning process under Science subjects across grade levels in Junior High School Program among selected secondary schools in the country. Specifically, it aimed to:

1. design and develop digitalized mind maps for teaching science;
2. assess the level of acceptability of science teachers in using digitalized mind maps in teaching as to usability, practicality, relevance and creativity; and
3. examine if there would be significant difference in the pretest and posttest scores of control and experimental groups before and after the use of digitalized mind maps.

METHODOLOGY

Research design

This study utilized mixed method research. The study utilized two major quantitative research designs namely: descriptive and experimental research. The study contained descriptive aspect as it assessed the level of acceptability of the developed digitalized mind maps for teaching science as to usability, practicality, relevance and creativity. On the other hand, the study also employed experimental research where it used control and experimental groups to examine the effectiveness of developed digitalized mind maps.

Respondents and locale of the study

The subject respondents of the study were the 300 randomly selected public secondary school science teachers from the selected public schools across the country. The study was conducted among selected regions, which for the purposes of the non-disclosure of schools and the regions where they situated, the researchers remained them concealed. On the other hand, the study also selected the participation of 30 purposively selected grade 10 students who served as control and experimental groups. Apparently, 15 learners were subjected to as the control group while 15 learners were subjected to as experimental group. The latter utilized the developed digitalized mind maps while the former was subjected to traditional approach.

Research instrument

The study employed researcher-made- survey questionnaire and teacher-made-test as primary researcher instruments of the study. For survey-questionnaire, it contained items relating to the level of acceptability of the respondents in relation to the developed and employed digitalized mind maps in teaching science as to usability, practicality, relevance and creativity. Pre-testing was employed in order to examine the reliability of the developed survey-questionnaire. Hence, it obtained a Cronbach Alpha of .817 which signified that the instrument was “Acceptable.”

On the other hand, the study also used teacher-made-test including pretest and posttest. The study used similar test. As contained in the test were the 30-multiple choice type items which are based on the topics and lessons covered during the implementation on the use of digitalized mind maps. The same test covered seven (7) topics under grade 10 Science. Validation and reliability tests were made as to determine the reliability and accuracy of the developed test. Hence, it obtained a verbal rating of “Acceptable,” which signified that the test are accurate, valid and reliable.

Treatment of data

The researchers designed and developed digitalized mind maps where they utilized modern application to illustrate and draw images in relation to the topical contents of each mind map. The researcher also formulated seven (7) mind maps which illustrate seven (7) different topics in Science 10. The designed and developed digitalized mind maps were uploaded to the Google Drive Link established by the researchers so teachers and learners being the subject respondents of the study can access the soft file of the developed instructional material. Meanwhile, as to the assessment of teachers in relation to the developed digitalized mind maps as to usability, practicality, relevance and creativity, survey-questionnaires were used. The survey-questionnaires were distributed through Google Forms.

Further, after the descriptive aspect of the study, the researchers proceeded with the actual implementation and use of the developed digitalized mind maps, the researchers selected one (1) section with 30 learners under Grade-10 Science at a certain school in CALABARZON. Implementation period run for three (3) weeks during scheduled science classes for grade 10. Before the actual use and implementation of digitalized mind maps, all learners were given a pretest. Thereafter, actual traditional teaching was used under control group while digitalized mind maps were used as intervention under the experimental group. After all the topics have been covered, posttest were given. All scores were encoded and organized through a digital facility through MS Excel. The same was used for statistical computation and interpretation.

FINDINGS AND DISCUSSION

Design and development of digitalized mind maps for teaching science

The researchers developed their own digital versions and structures of mind maps as anchored with the topics under grade 10 science. The researchers carefully illustrate images and visuals which are substantial for mind mapping. These images and illustrations are based on the significant information, concepts and principles under each topic. The researchers also utilized lines, arrows, color codes, shapes and other creative illustration which ensured the creation of creative and innovative presentation of significant concepts and principles for each topic. In addition, each digitalized mind maps are also called as min maps templates where learners used the same as their study notes and review guide. The design and development of digitalized mind maps for teaching science is based from the study of Kedaj et al. (2014) which reveals that basic principles of mind mapping are described including structural components, methodical frameworks, interactive, creative and innovative.

Level of acceptability of science teachers in using digitalized mind maps

Development and design of creative and innovative instructional materials are strong endeavor and engagement of teachers in the teaching and learning process. In this regard, teaching and learning plays very important role for the attainment of educational objectives. Based from the results of the study, creativity obtained the highest weighted mean of 3.97 which is verbally described as “Strongly Agree.” The results shows that teachers highly accepted the developed digitalized mind maps for teaching science because they immensely exhibit. The use of colors, personalized illustrations, images and the like greatly added to the flavors of creativity and resourcefulness which the digitalized mind maps possess. On the other hand, an overall mean of 3.87 suggests that science teachers also assessed the developed digitalized mind maps as highly practical, relevant and useful for teaching science. The findings significantly show that science teachers are highly convinced with the efficiency and potential significance of the developed digitalized mind maps. First, the material is highly economical which needs less financial support just to produce. In fact, it is vested on teachers’ own creativity and approach to create more valuable and highly creative material. Second, the material is useful where both teachers and learners can use the material as it summarizes key points. Use of arrows, lines and codes signify the only important and salient principles are contained, making the material more user-friendly. Third, the material is relevant because the researchers based their formulation and production on the prevailing learners’ needs and demands.

Significantly, science teachers highly accepted the developed digitalized mind maps. Practically, Dale’s Cone of Experience was highly evident as researchers developed more practical and experienced-based material where topics are intelligently summarized and deduced based. The findings affirmed the study of Nurhalima (2023) which reveals that mind maps helped learners improve their writing skills. Thus, the study shows that enhancement of attitudes and values, relevance and practical, are some of the remarkable benefits accruing from mind maps.

Difference in the pretest and posttest scores of control and experimental groups before and after the use of digitalized mind maps

Learners from control group obtains a mean score of 7.60 (sd=2.198) which is verbally described as “Beginning” while experimental group gains a mean score of 5.70 (sd=1.625) which is verbally described as “Beginning.” The results show that learners from control group obtain higher pretest scores over than the experimental group before the actual implementation of developed digitalized mind maps. On the other hand, as to the posttest scores, control group obtains a mean score of 15.60 (sd=4.564) which is verbally described as “Developing” while experimental group gains a mean score of 20.30 (sd=2.665) which is verbally described as “Advanced.” The result shows that learners who received the intervention and were able to use digitalized mind maps gained higher scores. Their understanding and skills based on the topics being discussed are more superior over learners from the control group.

In this regard, there was a significant difference on the pretest and posttest scores of learners from control and experimental groups (t -value= -4.231, df =8.00). This suggests that the developed digitalized mind maps in teaching and learning selected topics in science 10 are effective and efficient to use. The use of practical and creative instructional material which is reflective to the developed digitalized mind maps helped learners gained sufficient understanding on the concepts and principles in science. Practically, the developed instructional material also deeply engaged learners for it only presented summary and key information where learners able to retain and understand simply. The results affirmed the study of Hallen and Sangeetha (2015) which reveals that mind mapping developed learners critical and creative thinking skills. Also, the study reveals that mind maps are better to use when significant concepts should be drawn logically.

CONCLUSIONS

Development and design of a specific instructional material is a primary responsibility of teachers to ensure the delivery of quality instruction. In this line, developed digitalized mind maps adhered to the prevailing needs and demands for 21st Century teaching and learning process. The developed materials was highly accepted by science teachers as they examined that the material was creative, useful, practical and relevant to respond with the pressing instructional needs of both teachers and learners in science. Thus, there was a significant difference on the performance of control and experimental groups where learners under experimental groups gained advanced level of understanding and skills through their use and exposure with digitalized mind maps.

RECOMMENDATIONS

The study recommends further investigation on the effectiveness of the developed digitalized mind maps on other subject areas. Also, the study recommends to transfer the developed digitalized mind maps on websites that are internet-based in order to provide more reach and visibility for other learners around the country. Apparently, the study also recommends the consistent use of the developed material so as to explore its effectiveness further and to describe the potential challenges which teachers and learners may encounter in using the material.

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