

Integrating medicinal plants in teaching biology using 7e's instructional model: its effect on students' conceptual understanding and interest

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Abstract

Integrating medicinal plants in teaching biology using 7e's instructional model: its effect on students' conceptual understanding and interest. Several studies were conducted to investigate the effects of the 7E's Instructional Method and contextualized learning separately. This study aimed to connect medicinal plants to science education while utilizing the 7E's instructional model to have meaningful and interactive discussions between the learners and the teachers. This study utilized a mixed-method research design to collect data from sixty (60) grade 8 students of Marawi City National High School (MCNHS). The findings showed a notable improvement in the experimental group's biology conceptual understanding (mean score increased from 23.9 to 50.1) compared to the control group (mean score increased from 22.9 to 34). As for the interest level of the students, post-test results indicate that there is an increase in the interest level of the experimental group. However, this increase is not high enough to have statistically significant difference with the post-test result of the control group. Consequently, the relationship of conceptual understanding and interest levels of the students in the experimental group have been found to have no significant relationship. The use of the 7E's Instructional Model teaching method, which integrates medicinal plants, was perceived as effective, with most students noting improved understanding, practical application, and enjoyment. However, challenges such as instructional issues and group dynamics were highlighted.

Keywords: Biology Conceptual Understanding; Biology Interest; Medicinal Plants; 7E's Instructional Method

Introduction

Biology has proven challenging for both learning and teaching. Many biological ideas are abstract, intricate, and interconnected, making it difficult for students to examine or experience them first (Kurt, 2021). Cell division, nutrition, and ecosystems are topics in biology that have been found to be difficult in both learning and teaching (Salleh, 2021). In recent years, various studies have been conducted in order to address these issues. One of these is utilizing inquiry-based learning in the classroom such as 7E's instructional method developed by Eisenkraft (2003). The 7E's instructional model is inquiry-based learning that can enliven and enhance the skills of learners during the educational process (Rahman, 2022).

Meanwhile, medicinal plants are widely used to treat illnesses such as cough, fever, and stomachaches among the Meranaws. This practice is not baseless, as medicinal plants are the foundation of modern medicine; compounds of plants are the origin and an important source of compounds of drugs (Manzano et al., 2020). In the study of Rodriguez et al. (2021), it concluded that incorporating ethno-medicinal practices into science education can contribute to the preservation of the country's intangible cultural heritage and promote awareness of traditional knowledge among future generations. Their findings highlight the value of integrating localized ethnoscience into secondary science education. However, the study primarily emphasized the cultural and educational significance of ethno-medicinal knowledge, with limited empirical attention to its application across specific biology concepts and instructional approaches.

While Bibon (2021) demonstrated that localized knowledge, particularly knowledge of medicinal plants can serve as an effective springboard for improving students' conceptual understanding of biology. However, the study primarily used medicinal plants in the context of their traditional applications for preventing and treating diseases, it resulted to instructional activities that were largely centered on health- and disease-related biological concepts. Thus, limited evidence exists on the use of medicinal plants as contextual

anchors for teaching biology topics that extend beyond their traditional medicinal applications. Moreover, Bibon (2021) employed the 5E's instructional model, it leaves the potential of integrating medicinal plants within the 7E's instructional model less explored.

Overall, the findings of Rodriguez et al. (2021) and Bibon (2021) establish the potential of localized ethno-medicinal knowledge and medicinal plants as meaningful resources for science education. However, a gap remains in determining how medicinal plants can be systematically integrated into lessons covering a broader range of biology topics through an inquiry-based instructional framework such as the 7E's instructional model. In particular, limited empirical evidence exists on whether using medicinal plants as contextual anchors within the 7E's instructional model can simultaneously enhance students' conceptual understanding and interest in biology. The present study addresses this gap by integrating medicinal plants into 7E-based lessons covering selected biology topics and examining their effects on the conceptual understanding and interest in biology of Grade 8 students.

Thus, the integration of medicinal plants into the 7E's instructional model is grounded in constructivist learning theory which emphasizes that learners actively construct knowledge based on prior experiences (Piaget, 1952; Vygotsky, 1978), and contextualized learning, which connects knowledge to meaningful real-world contexts (Brown, Collins, & Duguid, 1989). Medicinal plants, as familiar and culturally relevant resources, can make biological concepts more meaningful and concrete, it potentially supports conceptual understanding and stimulates students' interest in biology. The 7E's instructional model complements this approach by providing a structured, learner-centered process through which students elicit prior knowledge, engage, explore, explain, elaborate, evaluate, and extend their understanding. Thus, medicinal plants serve as contextualized learning anchors, while the 7E's instructional model provides the instructional structure for active learning, with their integration expected to enhance students' conceptual understanding and interest in biology.

Therefore, this study aimed to investigate the effects of the integration of medicinal plants in biology education using 7E's instructional model as a method to teach participants and improve their conceptual understanding and interest in biology, aiming to foster meaningful and interactive learning processes between students and teachers.

Method

This study used an explanatory mixed-method design, a research approach that combines both quantitative and qualitative data in two sequential phases (Creswell, 2012). The Quasi-experimental matching-only pretest-posttest design was used for the quantitative data, while the interview and the journal were used for the qualitative data (Fraenkel & Wallen, 2020). The diagram of the design is presented below.

Experimental group	M	O	X	O
Control group	M	O	C	O

The M symbol represents the matching of the student samples in the experimental and control groups, which was based on their average grades from first, second, and third quarters of the science subject. The first column of O symbol represents the pretest of Biology Conceptual Understanding Test (BCUT) and the Biology Interest Questionnaire (BIQ), it was conducted to test their prior knowledge. The X symbol represents the intervention for the experimental group, which is the 7E's instructional model integrating Meranaw's medicinal plants. While C represents the conventional teaching method used in the control group. Finally, the second column of the O symbol represents the post-test, which was the same as the pre-test and was given after the intervention. Hence, quantitative data were collected in the form of test scores in the BCUT and BIQ survey questionnaires.

On the other hand, the qualitative data were obtained from interviews with selected students from the participants after the post-test. They were interviewed about their insights into the teaching methods. Other qualitative data were from the student's journal, which consisted of their perceptions, realizations, and challenges during intervention, and the field notes of the teacher-researcher that contained observations on the difficulties and problems they encountered during intervention and their interest in the biology topic domain.

The subject participants in the study were thirty (30) pairs of students coming from two intact sections of Grade 8 at Marawi City National High School (MCNHS) for the school year 2023-2024, and only two

sections were needed for this quasi-experimental study. The intervention process took 6 weeks, from March to May 2024.

The Biology Conceptual Understanding Test (BCUT) was guided by the bloom taxonomy of objectives and a table of specifications (TOS) was used for the distribution of test items in the different levels of bloom taxonomy of learning objectives. This test was based on the topic domain during the intervention. The questionnaire consisted of a multiple-choice type with four (4) choices (A, B, C, and D), and open-ended questions. The constructed test was checked and corrected by the thesis adviser for face validity, refinement of the structure and format of the questions, and the test's content. Subsequently, the corrections were incorporated. The test questions were then presented to three experts for further face and content validation. The suggestions and comments were then integrated to further improve the structure and format of the questions, as well as the content of the test.

At first, it was composed of eighty (80) items multiple choice. Since the instrument was developed by the researcher, it was pilot tested on grade 9 students of Sultan Angin Memorial National High School (SAMNHS), Saguieran, Lanao Del Sur. This is to evaluate the internal consistency of the test. Cronbach's alpha (α) was calculated across the test items to assess scale reliability. The BCUT demonstrated strong internal consistency, yielding an overall Cronbach's alpha coefficient of $\alpha = 0.794$. Since the coefficient comfortably exceeded the standard threshold of 0.70, the instrument was deemed highly reliable for measuring Grade 8 students' conceptual understanding of biology. As a result, there were 60 remaining multiple-choice questions and 12 open-ended questions, with a total of 125 points after item analysis.

To determine the levels of conceptual understanding in biology, a categorization was adapted from DepEd Order No. 31. In this categorization, scores ranging from 0-61 indicates a beginning level of conceptual understanding (0%-49%), scores from 62-80 correspond to developing level (50%-64%), scores from 81-98 corresponds approaching proficiency level (65%-79%), scores from 99-111 correspond to proficient level (80%-89%), and lastly, scores from 112-125 represent advanced conceptual understanding (90%-100%). Table 1 presents the categorizations used in this study.

Table 1. Categorization Level of Conceptual Understanding

Raw scores	Percentage scores (%)	Category level of conceptual understanding
112-125	90% - 100%	Advanced
99-111	80% - 89%	Proficient
81-98	65% - 79%	Approaching proficiency
62-80	50% - 64%	Developing
0-61	0% - 49%	Beginning

The Biology Interest Questionnaire was adopted from Eva Knekta, Ashley A. Rowland, Lisa A. Corwin, and Sarah Eddy (2020) to gain a clear understanding of the participants' individual interest in biology before and after the integration of the teaching method. The Biology Interest Questionnaire (BIQ) originally consisted of eleven (11) items corresponding to students' positive feelings toward biology, nine (9) items corresponding to the perceived value of biology, and thirteen (13) items corresponding to students' independent and voluntary reengagement in biology-related content and activities.

The authors used Exploratory Factor Analysis (EFA) to determine the questionnaire's dimensionality and identify problematic items. Confirmatory factor analysis (CFA) was used to confirm the results of the EFA ($\chi^2 = 312.45$, $df = 132$, $p < 0.001$). Moreover, measurement invariance was examined to evaluate whether the instrument functions equally for both majors.

After the authors collected validity evidence for internal structure, the Biology Interest Questionnaire (BIQ) was finalized, consisting of six (6) items corresponding to students' positive feelings toward biology, five (5) items corresponding to the perceived value of biology, and nine (9) items corresponding to students' 3 independent and voluntary reengagement in biology-related content and activities. Scoring was as follows:

1 = strongly disagree, 2 = disagree, 3 = slightly disagree, 4 = slightly agree, 5 = agree, and 6 = strongly agree.

The mean scores in the Biology Interest Questionnaire (BIQ) were based on the categorization by Pratiwi et al. al (2018). As shown in Table 2, the student interest scores were summed and converted into

percentages. A score ranging from 0-24 indicates very low interest (0%-20 %), scores of 25-48 corresponds to low interest 21%-40 %, scores of 49-72 reflect medium-level interest (41%-60 %), scores of 73-96 indicate high interest (61%-80%), scores of 97-120 correspond to very high interest (81%-100%).

Table 2. Categorization Level of Students' Interest

Raw scores	Percentage scores (%)	Category levels of interest
97-120	81%-100%	Very high interest
73-96	61%-80%	High interest
49-72	41%-60%	Medium interest
25-48	21%-40%	Low interest
0-24	0%-20%	Very low interest

The control group was taught using the conventional teaching method, while the experimental group was exposed to 7E's instructional model integrating medicinal plants. There are three phases in the data-gathering procedure: pre-intervention, intervention, and post-intervention. Each phase was carefully implemented. The pre-intervention phase involved the selection of the topic domains, construction of lesson plans, development and adoption of research instruments, asking permission from the principals of the schools where the pilot testing and the intervention were implemented, and pre-test administration of the research instrument.

The intervention phase is the implementation of the 7E's instructional method integrating medicinal plants into the experimental group and a conventional teaching method into the control group. Specifically, the experimental group was exposed to 7E's instructional model with integration of medicinal plants through hands-on activities and supplemental information about the active component(s) of the medicine, which is a probable cure for certain diseases in the human system. The class commenced by eliciting their prior knowledge of medicinal plants through short stories or by recalling their previous lessons. After eliciting their prior knowledge, the researcher showed pictures of medicinal plants if they were not available or if actual medicinal plants were brought to class to make the students engage in the lesson. Various questions were asked to engage the student and arouse their interest.

After engaging the students, the teacher-researcher allowed them to explore through hands-on activities. These activities were designed to address specific topic domains while promoting a comprehensive understanding of scientific concepts and their connection to medicinal plants.

After allowing the students to explore the topic for the day by giving them an activity, each group had one (1) representative to explain their findings. In this phase, the researcher verified and checked students' understanding.

After explaining their findings, short activities, such as board work and oral recitation will be conducted. This gave the participants a deeper understanding of the science concept and increased their interest in the topic of the day by integrating medicinal plants that are available in the locality. After elaborating on science concepts, the students were given an assessment to test their comprehension of the topic. This was a paper-and-pencil assessment, which is sometimes aided by pictures. Finally, the class ended by giving them assignment to extend the topic to an authentic situation. They were asked to research the medicinal plants that their parents used, or that they were familiar with, and the diseases these plants were used to cure.

After the intervention, the control group and the experimental group were given the post-test using the research instruments: Biology Conceptual Understanding Test (BCUT) and Biology Interest Questionnaire (BIQ). These were the same as the pretest given to the participants before the intervention.

Ten selected participants from the experimental group, preferably students who had high scores and low scores, were interviewed regarding their perception of the integration of Meranaw medicinal plants as a teaching method. These interviews were conducted at the convenience of the participants, with their consent to be interviewed. Furthermore, these were audio recorded with their permission, or they could write down their responses. The data gathered was validated through transcription, which was analyzed and interpreted after the intervention. The students' journals were checked for their insights into the teaching methods applied to them.

After data gathering, scoring and recording of the scores/data were done. The students' responses to the multiple-choice test were scored based on the number of correctly answered items. Each correct answer was assigned a score of one (1) point, while each incorrect answer or unanswered item received zero (0) points.

The total test score was obtained by summing the points earned across all items. The scores were recorded and tabulated, and the answers to the open-ended questions were rated by two experts and the researcher. Processing, statistical analysis, and interpretation were performed on the data gathered from the research instruments, such as the BCUT and BIQ. The statistical analyses of the raw scores include descriptive statistics, Levene's test, t-test, Mann-Whitney U test, and the correlation coefficient.

Results and Discussion

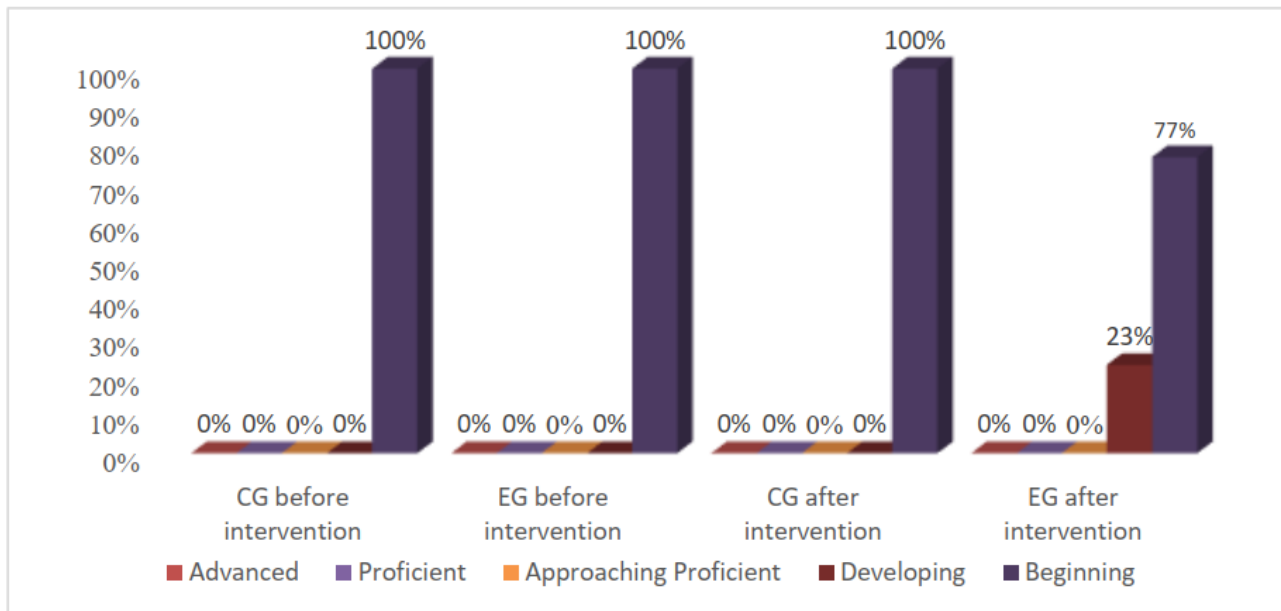


Figure 1. The Scores of The Control Group (CG) and Experimental Group (EG) in the Biology Conceptual Understanding Test (BCUT)

As shown in Graphic 1, before the intervention, 100% of the control group and the experimental group were at the beginning level of conceptual understanding. Both the control and the experimental groups had a similar distribution of conceptual understanding levels with all of the participants falling in the "beginning" category level, this could be attributed to a lack of knowledge before the discussion of the lessons

After the intervention, all (100%) of the control group and several (77%) of the experimental group remained at the beginning level. However, some (23%) of the experimental group moved up to the developing level of conceptual understanding, while nobody in the control group stepped up to this level. The improvement in the control group could be attributed to the conventional teaching method anchored by the K-12 Curriculum. The experimental group demonstrated a developing level of conceptual understanding which implies that the integration of medicinal plants in teaching biology concepts and the utilization of 7E's instructional model facilitate learning.

One explanation for this is that this method allows students to be engaged in various activities, which were elicited by telling a short story that anchored the whole session, for it contained questions that were answered as the class progressed. This short story is about medicinal plants. Furthermore, the students were grouped in every activity that allowed them to think and share their findings and knowledge with their classmates. Members of each group were randomly selected to maximize participation. Assignments were also given to supplement their knowledge about medicinal plants and other related topics.

The medicinal plants played an important role in making the topics more contextualized and localized, as the students are already familiar with some of these plants. The method allowed them to investigate the topic before arriving at a conclusion, to discover a variety of medicinal plants and their multiple uses, and at the same time, improve their conceptual understanding in the topic domain. This is supported by the findings of Montero and Geducos (2022) that localized and contextualized learning activities improve the conceptual understanding of biology. Likewise, the effectiveness of integrating medicinal plants into lesson plans was done by Bibon (2021). His study had positive results in improving the conceptual understanding in biology of the students on Cagraray Island, Philippines. Furthermore, Arindig (2019) also used 7E's instructional model in her intervention and revealed that this model increases the conceptual understanding and academic achievement of the students in biology. This result may be because 7E's instructional model is learner-centered

(Fatima & Anggrisia, 2019) in which students are required to play an active role during the learning progress to obtain the competencies allotted for the session.

Table 3. The variances of the control and experimental groups were comparable in terms of their conceptual understanding

Period	Group (n=30)	Levene's Test for equality of variances		Mean Score	SD	t-value	p-value
Before Intervention	Control	.01	.91(ns)	22.96	7.23	-.51	.61(ns)
	Experimental			23.90	6.91		
After Intervention	Control		1.87	34.03	1.91	-5.27	.00 (s)
	Experimental	.17(ns)		50.16	2.38		
Mainn Gain Score	Control				11.06	1.41	-5.74
	Experimental				26.26	2.23	.00 (s)

Before the intervention, as shown in Table 3, Levene's test ($F = .01$, $p = .91 > .05$) was not significant, it indicates that the two groups were comparable in prior knowledge of the topic domain due to the non-significant variance. Additionally, both groups had very low mean scores (22.96 vs. 23.90) beforehand. This is understandable since neither group had been exposed to a discussion about the topic domain. Furthermore, it was observed by the researcher that most students struggled to answer the questions related to the conceptual understanding test, as indicated by their many queries during the pretest. The t-test before the intervention result ($t = -.51$, $p = .61 > .05$) shows no statistically significant difference between the control and experimental groups, it suggests that both began with a similar level of conceptual understanding.

After the intervention, Levene's test result ($F = 1.87$, $p = 0.17 > .05$) was not significant, this means that the variances of the two groups were comparable in terms of their conceptual understanding. Hence, comparison of the post-test mean scores (34.03 vs. 50.16) of the two groups were done. The result of the t-test ($t = -5.27$, $p = 0.000 < 0.05$) is also shown in table 3. Since the p-value is significant, this means that there is a significant difference between the two groups after the intervention. This outcome indicates that the experimental group outperformed the control group after the intervention. This can be interpreted as integrating medicinal plants in teaching biology using the 7E's instructional model having a positive impact on the learning outcomes of the experimental group. For the mean gain scores of the two groups (shown also in Table 3), the control group gained 11.06, while the experimental group gained 26.26, showing a significant difference ($t = -5.74$, $p = .00 < .05$). The intervention likely incorporated an effective teaching method that helped the experimental group better understand the topic domain.

The data presented in the table indicate that the experimental group demonstrated greater improvement in their conceptual understanding on the topic domain of biology compared with the control group. It can be primarily attributed to the contextual integration of medicinal plants as the core instructional anchor. While active learning frameworks such as the 7E's instruction model, Problem-Based Learning (PBL), and reflective journaling provided the structural scaffold for classroom activities, the medicinal plant content served as the critical cognitive bridge enabling the improvement of the students' conceptual understanding. Abstract biological topics such as digestive system, cell division, biodiversity, and ecosystem are commonly encounter difficulties in conceptual understanding for high school learners when taught through generic textbook examples. By embedding familiar medicinal plants directly during the intervention phase, the intervention activated students' pre-existing household schema and indigenous funds of knowledge.

This is supported by Cognitive Load Theor (Sweller, 2020), it is connecting abstract scientific concepts to highly familiar, real-world phenomena which reduces working memory overhead. It allows learners to process complex biochemical relationships more efficiently. In addition, this finding directly supports recent study by Saro et. al (2022), who demonstrated that localized and contextualized science instruction leads to statistically significant leaps in student conceptual performance compared to non-contextualized instructions. The data presented proved that 7E's instructional model integrating medicinal plants is more effective than the conventional teaching method.

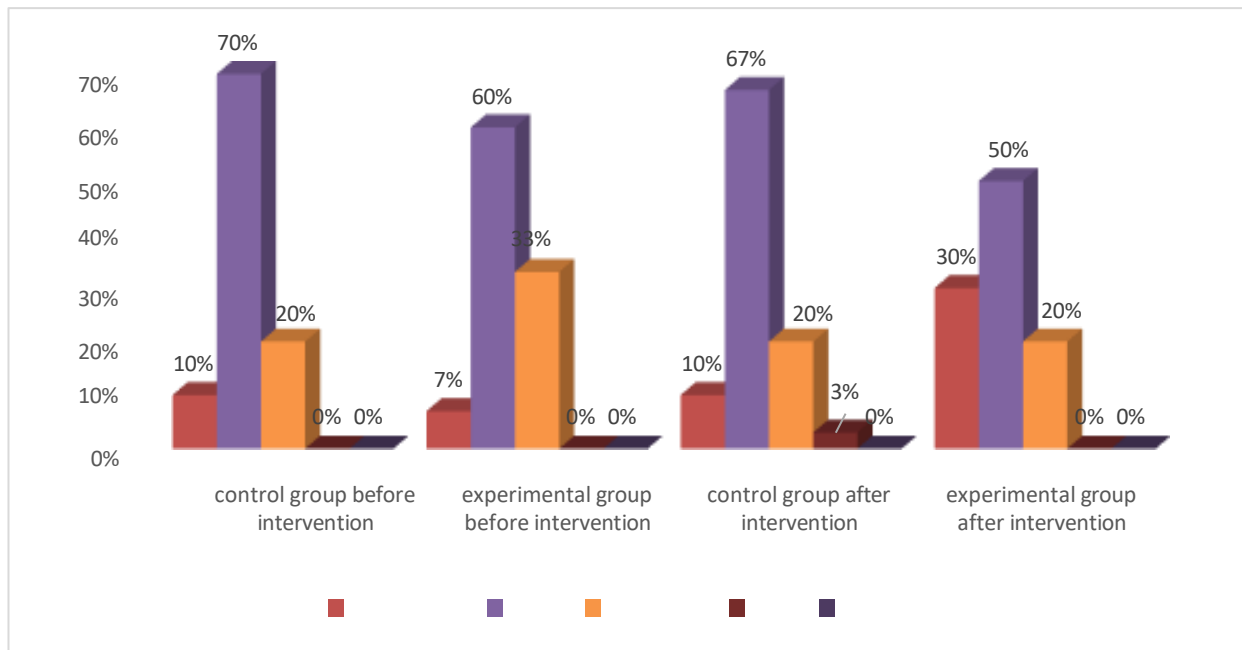


Figure 2. The scores of the control and experimental groups in the Biology Interest Questionnaire

As shown in Graphic 2, before the intervention, few (10%) of the control group had a very high interest in biology, most of them (70%) had a high interest in biology, and some of them (20%) had a medium interest in biology. After the intervention, only a few (10%) maintained their very high interest in biology, several (67%) maintained a high interest, and some (20%) had a medium interest in biology. Incidentally, very few (3%) participants in the control group stepped down to a low interest in biology. The interest levels of the control group remained relatively stable. A conventional teaching method was employed for the control group, which was based on the K-12 Curriculum, where group activities were also required to be performed by the students. There were no apparent changes in the way they were being taught.

As Graham & Woodcock (2020) noted, traditional approaches like lectures and textbooks provide structure, but they are frequently criticized for causing low student engagement and failing to promote critical thinking abilities. Therefore, teachers need to make rapid changes in the curriculum to cope with the different needs of learners and the complex classroom conditions. In line with this, the conventional teaching method may maintain the interest of students, but it does not guarantee an increase in interest as the students are familiar with the method, which may lead to undesirable results in the curve of their interest. Hence, while the control group showed stable interest, these studies suggest that integrating more active learning strategies and hands-on experiences could lead to greater improvements in students' engagement in biology.

Meanwhile, before intervention, few (7%) of the experimental group had a very high interest in biology, many of them (60%) exhibited a high interest in biology, and lastly, some of them (33%) were of medium interest in biology. However, after the intervention, many of them (30%) had a very high interest in biology. This means that 23% of them stepped up to this level (very high interest), half of the experimental group (50%) were at the high-interest level in biology, and, lastly, several of them (20%) had a medium interest in biology. Findings indicated an increase in the level of interest and enthusiasm among the experimental groups. The students showed an increase in the number of very high interest levels, which reduced the number of high and medium interest levels. This suggests that the intervention used in the experimental group was not only effective in improving conceptual understanding in biology but also increased students' interest in the subject.

This result could be attributed to the strategies employed, one of which is short stories involving medicinal plants and the question-and-answer portion as the learning progressed. As Kurt (2020) stated in Anchored Instruction Theory that connecting prior knowledge to authentic situations, students can apply their knowledge to a specific topic in real-life contexts. These situations are realistic to help students develop a deeper understanding of a topic and make connections. Students' prior knowledge was elicited, enabling them to apply it in a real-life context. Through this process, the students' interest in the subject increased because of the real-life situation that was related to the topic domain, which was verified by their journal entries on how they were able to understand the concepts and comprehend the importance of medicinal plants.

Table 4. The Mann-Whitney U Test Was Used to Assess and Compare The Students' Interest In Biology

Period	Group (n=30)	Mean Rank	Sum of Ranks	Mann-whitney U	Wilcoxon W	Effect size (r)	Z	Asymp. Sig. (2-tailed)
Before Intervention	Control	31.05	931.50	433.50	898.50	.034	-.026	.79 (ns)
	Experimental	29.95	898.50					
After Intervention	Control	26.87	806	341	806	.22	-1.71	.08 (ns)
	Experimental	34.13	1024					

The Mann-Whitney U test results showed no significant difference in interest levels between the control and experimental groups ($U = 433.50$, $p = .79 > .05$), which means that they are comparable in terms of interest in biology before intervention.

After intervention, although the post-test showed higher interest in the experimental group as they exhibited higher mean rank (26.87 vs. 34.13) and sum of ranks than the control group (1024 vs. 806), the difference between the two groups was not statistically significant ($U = 341$, $p = .08 > .05$). Although the experimental group showed an increase in interest after the intervention, this difference was not large enough to be statistically significant.

The post-intervention interest analysis ($z = -1.71$, $r = .22$) demonstrates a noticeable shift from the baseline equivalency observed at pretest ($z = -0.262$, $r = 0.034$). Although this post-test difference did not reach the required level for statistical significance, the small-to-moderate effect size ($r = .22$) suggests that integrating medicinal plants within the 7E's framework exerted a positive descriptive pull on students' interest. Because the 95% confidence interval slightly spans zero ($[-0.038, +0.480]$), the statistical non-significance is primarily attributable to sample size constraints ($N = 60$) rather than a complete absence of instructional impact. An extension of the duration of intervention beyond six weeks or expanding the sample size would provide the statistical power necessary to verify whether the increased interest in biology corresponds to a statistically significant population effect.

In addition, several factors may have affected their interest, such as language barriers, environmental factors, and personal factors. Apparently, distractions occurred during intervention. This has affected their interest in biology for recommendation. However, the results still indicate that the experimental group became more interested compared to the control group due to the intervention based on the higher mean rank of the experimental group after the intervention, in comparison with the control group, they had higher mean rank before the intervention but became lower after intervention.

Collaboration, teamwork, and experiments were the key elements that enhanced their learning experiences. This is supported by the Experiential Education Theory by John Dewey (1938) which state that the use of experiments was particularly effective in helping students better understand the subject and fostering a deeper interest in learning. Some of the activities of these two groups were different because the experimental group's activities were on medicinal plants, while the control group's activities were based on what was provided in their textbooks. These activities are positive experiences in which, according to Krapp (2012), positive experience states are linked to any interest and possess attributes of personal meaning. The best experience modes are those that include positive cognitive and affective characteristics and are based on interest and interactions with the environment. Interest-based activities can lead to flow if the right circumstances are met.

Table 5. The correlation coefficient

Period	Relationships of the biology conceptual understanding and interest in biology		Correlation coefficient	p-value	Remark
Before Intervention	Control group BCUT	Control group BIQ	.093	.480	NS
	Experimental group BCUT	Experimental group BIQ	.052	.784	NS
After Intervention	Control group BCUT		Control group BIQ	.331	.010
	Experimental group BCUT		Experimental group BIQ	.098	.605

Before the intervention, both the p-values of the control group and the experimental group were higher than .05 level of significance (.480 and .784, respectively), which are not significant. This means that there is no significant relationship between students' conceptual understanding and interest in biology in both the control and experimental groups before intervention. Similarly, results of the experimental group after intervention with a p-value (.605 > .05) was found to be not significant. However, the result of the control group after the intervention was significant (.010 < .05). This means that there is a significant relationship between the students' conceptual understanding and interest in biology of the control group.

Although the p-values are not significant, the correlation coefficient (r) value of the students' conceptual understanding and interest in biology was positive. This means that the effect is not strong enough, perhaps because the sample size is not large enough to determine statistical differences. According to Bobbit (2020), a small amount of data requires a very large effect to achieve significance.

In the control group, student interest was an important factor in determining conceptual understanding. This is consistent with the idea that motivated students tend to engage in more and perform better. In contrast, the improvement in the experimental group's conceptual understanding was not dependent on interest, suggesting that the intervention itself provided the necessary learning support. This finding implies that even students with varying levels of interest benefited from the experimental teaching method.

This result aligns with the cross-sectional analysis of the opposing trend interplay between conceptual understanding and interest in secondary school chemistry by Hoft et. al(2018). This study found a positive correlation between students' conceptual understanding and interest across all secondary school grades. According to Adamma et al. (2018), when the learning environment leans on getting high grades, students diminish the development of their intrinsic interest. The student's interest and conceptual understanding do not necessarily need to be at par since they are motivated to pass the subject in order to be promoted to a higher level.

Developing the interest of the students cannot be solely entrusted to the teaching method employed by the learners because interest is only long-lasting if the individual shows a consistent preference for the information (Harackiewicz, 2016). Furthermore, interest should include the affective domain and not just the cognitive domain to be manifested.

Perceptions of the students on 7E's Instructional Model integrating Medicinal Plants

The experimental group of students expressed their perceptions of the use of 7E's Instructional Model integrating Medicinal Plants through interviews and journals. The following are the transcribed interviews of the students that are categorized into different themes as follows;

First, it improves understanding which is supported by Gyampoh et al. (2020), his study showed that using the 7E learning cycle can help students better understand science. The study found that starting with hands-on activities and group work helped students think more deeply before formal teaching. Similar to the students' responses, in which they remembered their experiments during discussions, which made it easier to connect ideas. They also said that working with classmates and using stories made lessons clearer and more meaningful. This supports the idea that performing activities first, followed by discussions, helps students build a strong understanding. This implies that the integration of medicinal plants using 7E's instructional model functioned as a cognitive storyline that transformed learners from curiosity to clarity. This is supported by Experiential Learning Theory by Kolb (1984), which suggests that knowledge is constructed through concrete experiences followed by reflection and conceptualization. In this study, students' engagement in medicinal plant activities prior to discussion enabled them to connect ideas more effectively, transforming curiosity into conceptual clarity.

Second, it enhances engagement and enjoyment which supports the idea that emotional elements, such as storytelling, real-life connections, and social interaction, can ease the learning process and keep students engaged. Enjoyment also plays an important role in this process. It was not just a bonus but also a key factor that helped students stay focused and understand the material more deeply. Building on students' experiences with the integration of medicinal plants in biology lessons through 7E's instructional model, the study by de

Guzman and Magpantay (2020) supports the emotional engagement this method fosters. In their research, students reported that storytelling made lessons more enjoyable and memorable, while group activities and repeated team interactions built a sense of excitement and unity, which is similar to how students in the experimental group described enjoyment in experiments and collaborative tasks.

Third, it promotes practical value and awareness of medicinal plants which means that the integration of medicinal plants made the students realize of its significance, which can motivate them to learn more about it while simultaneously learning the topic domain. By relating lessons to everyday experiences, such as disease prevention and natural remedies, the instructional model empowered students to see biology not just as an abstract science but as a subject with practical benefits for health and wellness. These findings align with that of Apeadido et al. al. (2024) who highlighted the importance of practical work in biology education as it demonstrated that it does not only improves students' science process skills but also their overall academic performance.

Lastly, it needs for clearer guidance and scaffolding. The students did not reject the integration of medicinal plants into the 7E instructional model. Instead, they pointed out that students have different levels of readiness when it comes to learning process. For some learners, the engagement phase of the 7E's instructional model should include clearer prompts or guiding questions to help them understand what to expect. Their feedbacks suggest that starting with inquiry alone might leave some students behind if necessary information or concept are not provided.

Hence, instructional flexibility is necessary to accommodate the different learning styles. The order in which activities are conducted should be adaptable; it allows some students to benefit from initial discussions that establish context, while others may thrive by diving directly into hands-on activities. Such differences can help create a more inclusive learning environment, in which all students can find a comfortable entry point into the content.

This is supported by the study of Gheysens et al. (2023) that explores how differentiated instruction can create more inclusive classrooms by addressing individual learning needs and maximizing learning opportunities. This emphasizes the importance of instructional flexibility and adapting the order of activities to accommodate different learning styles. Some students need more help before starting activities, especially when learning about new topics. Providing clear explanations or examples in the beginning can make it easier for them to understand and feel confident. Adding support, such as short previews or guiding questions, during the Engage phase of the 7E's instructional model can help students grasp the concept better. In this way, students have a fair chance to learn whether they prefer starting with a discussion or jumping into hands-on tasks.

Conclusion

This study found that integrating medicinal plants into the 7E's Instructional Model was effective in improving the conceptual understanding of Grade 8 students of Marawi City National High School (MCNHS). The findings suggest that contextualized and learner-centered instruction can help students connect biological concepts with familiar, real-world contexts. Although an increase in students' interest in biology was observed, the post-test results did not show a statistically significant difference. thus, the study does not provide sufficient statistical evidence to conclude that the intervention significantly increased students' interest.

The findings should be interpreted within the study's limitations, including its relatively small sample, the use of two intact classes from one school, and the limited intervention context. Therefore, the findings may not be directly generalizable to other schools, grade levels, or educational settings. Nevertheless, the study provides evidence of the potential of medicinal plants integrated through the 7E's Instructional Model to enhance students' conceptual understanding of biology. Future research may examine the approach using larger and more diverse samples, multiple schools, and longer intervention periods. Researchers may also investigate its effects on science literacy, knowledge retention, higher-order thinking skills (HOTS), and its applicability across other science disciplines and grade levels.

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