Knowledge, Perception, and Prevalence of Traditional Herbal Medicine Use Among High School Students: A Needs Assessment for STEM Lesson Development

Annabeth M. Aque and Monera A. Salic-Hairulla
Mindanao State University – Iligan Institute of Technology, Bonifacio Ave., Tibanga, Iligan City, 9200, Philippines
*Corresponding author email: annabeth.aque@g.msuiit.edu.ph

Abstract

This study assessed the knowledge, perception, and prevalence of traditional herbal medicine (THM) use among high school students in Iligan City, Philippines, as a basis for identifying instructional needs for future STEM-based lesson development. The research employed a descriptive survey design to determine students' levels of knowledge, attitudes, and practices regarding herbal medicine. A total of 146 students participated through an electronically administered questionnaire. Results revealed a generally positive perception of herbal medicine among students, who viewed it as affordable, culturally significant, and effective for disease treatment. However, gaps were found in students' understanding of safety, efficacy, and proper dosage, as well as in their awareness of potential side effects. The majority reported using herbal medicines occasionally, mainly for common ailments such as fever and headaches, with family members being their primary source of information. The findings highlight a strong reliance on informal knowledge sources and a limited integration of scientific understanding about herbal medicine. This needs assessment underscores the need for STEM lessons that emphasize scientific argumentation, evidence evaluation, and culturally responsive pedagogy. The study recommends employing a Design-Based Research (DBR) approach in future lesson development and incorporating a qualitative component to explore cultural rationales underlying THM practices.

Keywords: needs assessment, traditional herbal medicine, perception, STEM education, health literacy

1. Introduction

Traditional herbal medicine (THM) constitutes a significant component of health-seeking practices across many societies and remains particularly resilient in regions where cultural heritage and access to natural resources intersect. The World Health Organization (WHO, 2019) reports that more than 80% of populations in low- and middle-income countries rely on herbal medicine for primary or complementary care, reflecting both

accessibility and cultural continuity. In the Philippines, ethnomedicinal knowledge persists within familial and community structures, reinforced by intergenerational transmission and the availability of medicinal flora in both rural and urban settings. Government recognition through the Department of Health (PIA, 2023) further institutionalizes THM, endorsing specific plants for therapeutic use and demonstrating the coexistence of traditional and biomedical systems.

Adolescents represent a critical demographic for examining THM knowledge and practice due to their developing scientific reasoning capacities and exposure to both informal cultural knowledge and formal schooling. Existing studies indicate that youth typically possess favorable perceptions of herbal remedies, viewing them as affordable, natural, and culturally legitimate, yet demonstrating limited knowledge about pharmacological mechanisms, dosage, efficacy, contraindications, and herb–drug interactions (Xie et al., 2020; Alshahrani, 2024; Chaachouay, 2025; Zakeri et al., 2025). Such gaps underscore the need not only for public health education but also for the integration of culturally situated health topics into science and STEM education.

From a STEM education standpoint, scholars have argued for curricular designs that promote scientific literacy, critical evaluation of claims, and informed decision-making, particularly in health-related contexts (Arnold & Bauer, 2021; Zeyer & Dillon, 2019). Argumentation and evidence evaluation are central to modern STEM competencies and are recognized for their role in preparing learners to navigate socioscientific issues, including those related to traditional medicine. However, Philippine science curricula rarely address THM explicitly, resulting in a disconnect between students' lived cultural experiences and formal scientific learning.

Design-Based Research (DBR) has emerged as a rigorous methodological framework for developing educational innovations situated in authentic contexts (Hall, 2020, Tinoca et al., 2022). DBR emphasizes iterative design, empirical testing, and refinement of instructional materials in partnership with local stakeholders. For culturally mediated topics such as THM, DBR provides an avenue for aligning cultural relevance with disciplinary rigor. Reviewer feedback on the present study strongly encouraged the application of DBR in future lesson development, alongside qualitative inquiry to explore cultural rationales—particularly students' reliance on family knowledge sources over formal health instruction.

Knowledge, Perceptions, and Prevalence of Traditional Herbal Medicine (THM)

Research across diverse cultural contexts consistently shows that adolescents and young adults encounter THM primarily through informal knowledge networks such as family, relatives, and community elders (Adhinarayanan & Kathirvel, 2025; Lepcha, 2022). These informal channels emphasize experiential knowledge, cultural legitimacy, and affordability, often positioning THM as an accessible first-line response to common ailments. However, studies have also documented limited understanding of pharmacological action, safety, proper dosage, and contraindications among youth populations (Chaachouay, 2025). This public health concern has been cited particularly in contexts where herb–drug interactions pose clinical risks when THM is used concurrently with biomedical treatments.

Data from multiple national surveys indicate high prevalence rates of herbal medicine use among adolescents, with usage ranging from occasional to habitual depending on cultural norms, household health practices, and perceived treatment efficacy (Liu et al., 2021). Perceptions of efficacy are strongly associated with familial endorsement and cultural continuity, while perceptions of safety demonstrate greater ambiguity, as youth often lack access to scientific information regarding toxicity thresholds, bioactive compounds, or clinical evidence. These findings underscore a structural gap between cultural health knowledge and formal scientific instruction.

STEM Education, Scientific Literacy, and Argumentation

Contemporary models of STEM education increasingly emphasize scientific literacy not merely as conceptual knowledge but as the capacity to apply scientific reasoning to real-world, uncertain, and culturally embedded problems. Socioscientific issues—such as vaccination, food safety, or traditional medicine—represent ideal contexts for cultivating argumentation, evidence evaluation, and informed decision-making (Arnold & Bauer, 2021; Zeyer & Dillon, 2019). Instructional research within STEM has demonstrated that adolescents benefit significantly when curricula engage culturally relevant phenomena, as these enhance motivation, identity alignment, and epistemic engagement (Bendu, 2024).

Scientific argumentation frameworks further assert that students must learn to articulate claims, support them with empirical evidence, and critique competing explanations—skills directly applicable to evaluating THM safety and efficacy claims. Without such competencies, youth tend to rely on anecdotal evidence, cultural authority, or community norms in determining health behaviors, rather than scientifically vetted evidence.

Design-Based Research (DBR) and Culturally Responsive Lesson Development

Design-Based Research has become a leading methodological approach for the iterative creation and refinement of instructional materials that must function within authentic learning environments (Hall, 2020, Tinoca et al., 2022). DBR bridges theoretical perspectives from learning sciences with practical development cycles in classrooms, producing empirically grounded instructional innovations. For health-related STEM content such as THM, DBR provides structured mechanisms for integrating cultural responsiveness, scientific rigor, and stakeholder participation—including teachers, students, and local knowledge holders.

This study was designed as a needs assessment to identify existing knowledge gaps, misconceptions, and educational needs among high school students regarding traditional herbal medicine. The findings will serve as a basis for developing a STEM-based lesson integrating ethnobotanical concepts, safety considerations, and scientific inquiry related to traditional medicine use.

Objectives

The study aimed to assess the knowledge, perception, and prevalence of traditional herbal medicine use among high school students in Iligan City. Specifically, it sought to:
- Determine the level of knowledge of high school students regarding traditional herbal medicines.
- Examine students' perceptions toward the use of herbal medicines.
- Identify the prevalence and patterns of herbal medicine use among students.
- Identify gaps and needs in students' understanding that may guide the development of a STEM-based lesson on traditional herbal medicine.

## 2. Methodology

2.1 Research Design

A descriptive quantitative research design was employed to conduct a needs assessment on high school students' knowledge, perceptions, and practices concerning traditional herbal medicine (THM). This design was appropriate for capturing baseline patterns and identifying instructional gaps relevant to STEM lesson development. The study served as Phase 1 of a longer-term instructional research agenda that will involve future design, implementation, and refinement cycles aligned with a Design-Based Research (DBR) trajectory.

2.2 Participants

The study involved 146 high school students from Iligan City, Philippines, consisting of 27 junior high school students (18.5%) and 119 senior high school students (81.5%). Participants were recruited through convenience sampling due to accessibility constraints and to accommodate natural variation in grade level, socioeconomic background, and prior exposure to THM. Ages ranged from 13 to 19 years. Participation was voluntary, and no identifying information was collected.

The respondents included 79 females (54.1%) and 67 males (45.9%). In terms of family income, 36.3% reported earning between ₱10,000 and ₱25,000 monthly, 24.7% between ₱25,000 and ₱50,000, 21.2% above ₱50,000, and 11% below ₱10,000.

Figure 1. Demographic Distribution of Respondents
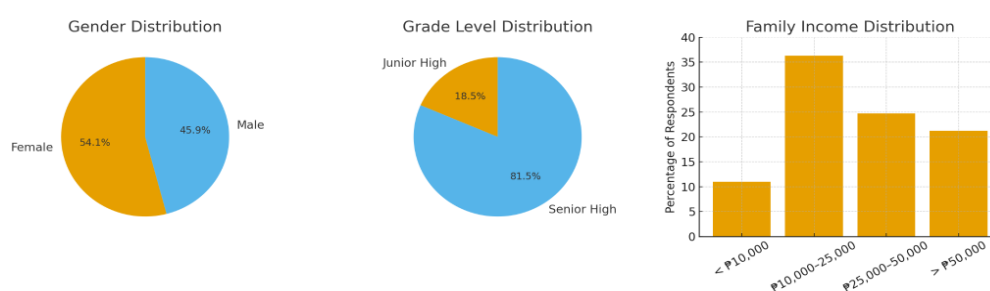
Most respondents came from lower- to middle-income households, consistent with the socioeconomic profile of typical public high school students in Iligan City. The distribution by gender and grade level also suggests adequate representativeness for analyzing students' knowledge and perceptions across age and maturity levels.

2.3 Research Instrument

Data were gathered using an online survey administered through Google Forms. The instrument consisted of 33 items adapted from Al Akeel et al. (2018), originally developed to assess public knowledge, perceptions, and usage of herbal medicines. Items were organized into four sections: (1) demographic information, (2) knowledge of THM, (3) perceptions toward THM, and (4) usage and prevalence patterns. Content validity was reviewed by two science education faculty members and one health professional to ensure clarity and contextual adaptation for Filipino youth.

2.4 Data Collection

Data collection occurred over a two-week period during the second academic quarter of 2024. School administrators and classroom advisers assisted in survey dissemination through official communication channels. Participants were briefed on the study purpose and assured of confidentiality prior to accessing the survey link.

2.5 Data Analysis

Data were analyzed using descriptive statistics, including frequencies, percentages, and weighted means, to characterize participants' knowledge, perceptions, and usage patterns. The weighted mean interpretation for perception items followed standardized scales consistent with prior research using the instrument. Results were then reorganized according to the study's four research objectives to facilitate instructional interpretation and alignment to the needs assessment framework.

2.6 Ethical Considerations

Ethical protocols were observed throughout the study. Participation was voluntary, informed assent was obtained prior to survey participation, and no personal identifiers were collected. Institutional permission was secured from participating schools, and the study adhered to guidelines for research involving minors.

3. Results and Discussion

3.1 Knowledge of Herbal Medicine

The findings reveal that while high school students in Iligan City possess a foundational awareness of traditional herbal medicine, their scientific understanding remains incomplete. As shown in Table 1 of the original study, a large majority of respondents (75.3%) identified the primary purpose of herbal medicine as therapeutic, followed by immunotherapy (61%). This reflects a recognition of the medicinal value of plants consistent with national surveys on alternative medicine use (PIA, 2023; WHO, 2019).

Table 1. The Extent of the Knowledge of the Participants about Herbal Medicine

Question	Answer	Frequency (n=146)	Percentage
What is the purpose of using herbal medicine?	Immunotherapy	89	61
	Therapeutic	110	75.3
	Cosmetic	30	20.5
	Other	11	7.5
Is mixing herbs together leads to a more effective result?	Yes	74	50.7
	No	14	9.6
	I don't know	58	39.7
Are there any instructions and restrictions to be taken into consideration when using herbs?	Yes	119	81.5
	No	5	3.4
	I don't know	22	15.1
Are there any side effects to using herbal medicine?	Yes	99	67.8
	No	10	6.8
	I don't know	37	25.3
What is the source of information you have about herbs?	Parents and relatives	125	85.6
	Friends and colleagues	28	19.2
	TV and scientific programs	74	50.7
	Doctors and herbalists	59	40.4
	Internet and social media	104	71.2
	Study and learning	53	39.7

However, 39.7% of respondents reported uncertainty about whether mixing different herbs enhances efficacy, and one-fourth (25.3%) were unsure of possible side effects. This finding indicates a knowledge gap regarding the biochemical mechanisms and interactions of plant compounds, suggesting that students' beliefs are primarily grounded in anecdotal or experiential evidence rather than scientific reasoning (Xie et al., 2020; Alshahrani, 2024; Zakeri et al., 2025).

The majority of respondents (81.5%) acknowledged that certain precautions and restrictions should be observed when using herbs, showing awareness of the importance of safe use. Yet, despite this, very few students could identify specific safety guidelines or toxicity limits, which echoes findings by Chaachouay (2025) that public awareness of herb–drug interactions and dosage safety remains limited even among educated populations.

Regarding information sources, students overwhelmingly cited parents and relatives (85.6%) and the internet/social media (71.2%) as their primary references, while only 39.7% attributed their knowledge to formal study or academic learning. This pattern emphasizes the dominance of informal, community-based transmission of knowledge and the relative absence of structured scientific education about herbal medicine in the school curriculum (Patrick et al., 2022; Lim et al., 2022). The dependence on non-academic sources underlines the educational need for evidence-based instruction that contextualizes traditional knowledge within biological and chemical principles.

3.2 Perceptions Toward Herbal Medicine

As shown in the perception table of the original study, students' responses had a weighted mean of 2.99 ("high agreement"), indicating an overall positive attitude toward herbal medicine. The highest-rated perception statements were "Inherited culture plays an important role in the use of herbs" (mean = 3.40) and "Herbs are less expensive than pharmaceutical drugs" (mean = 3.36). These results highlight two major drivers of herbal medicine use among youth: cultural continuity and economic accessibility.

Table 2. The Weighted Arithmetic Means

Scale of means	Scale of agreement	Scale point	Judgment of agree
1.00-1.75	Strongly disagree	1	Very low
1.76-2.50	Disagree	2	Low
2.51-3.25	Agree	3	High
3.26-4.00	Strongly agree	4	Very high

Table 3. Means and Standard Deviations of the Perception of the Participants about Herbal Medicine

Item	Mean	Standard Deviation	Degree of agreement	Rank
Herbs have value in treating diseases.	3.18	0.538	High	3
Herbs are less expensive than pharmaceutical drugs.	3.36	0.631	Very High	2
Herbs are more accessible than pharmaceutical drugs.	2.97	0.714	High	5
Inherited culture plays an important role in the use of herbs.	3.40	0.639	Very High	1
Herbal medicine enables people to reduce their reliance on pharmaceutical drugs.	2.82	0.779	High	7
Herbal medicine is safer than pharmaceutical drugs.	2.24	0.736	Low	8
Herbal medicine requires consultation with your doctor.	3.10	0.816	High	4
Sufficient awareness exists regarding medicinal herbs.	2.88	0.886	High	6
Weighted Mean	2.99	0.717	High	

Students' belief that "herbs have value in treating diseases" (mean = 3.18) aligns with prior findings from similar age groups in other contexts (Nworu et al., 2015), suggesting a universal perception of herbal efficacy among adolescents. This belief, however, may not necessarily translate to understanding scientific evidence behind herbal remedies. The perception that herbal medicines are cheaper and more accessible further reinforces their practical value within low- to middle-income households, as represented in the study's socioeconomic profile.

Interestingly, students expressed a low level of agreement with the statement "Herbal medicine is safer than pharmaceutical drugs" (mean = 2.24), indicating a degree of

skepticism and awareness of potential risks. This balanced perception suggests that students do not uncritically accept herbal medicine but lack the technical background to evaluate its pharmacological properties and safety scientifically. Similarly, a moderately high agreement was recorded for "Herbal medicine requires consultation with your doctor" (mean = 3.10), showing an emerging understanding that traditional and modern healthcare practices can be complementary.

Taken together, these findings portray students as open-minded but underinformed—valuing tradition yet seeking scientific validation. The data point to a pedagogical opportunity: integrating herbal medicine topics into STEM lessons could serve as a culturally relevant context for developing scientific inquiry, data interpretation, and health literacy. Lessons can engage students in questioning assumptions, analyzing active compounds, or comparing empirical data with folk claims, fostering both scientific rigor and cultural sensitivity.

3.3 Prevalence and Usage Patterns

The survey revealed a remarkably high prevalence of herbal medicine use among students—94.5% reported having used herbs at least once, with 81.5% using them "only when needed." These results corroborate global findings that adolescents frequently use herbal remedies as complementary or first-line treatment for minor ailments (Anheyer et al., 2017).

Most students reported using herbs derived from leaves (92.5%), which aligns with the Philippine ethnobotanical tradition of decocting or infusing leaves for therapeutic use (Tantengco et al., 2018; Caunca et al., 2021). Common ailments treated included fever (59.6%), headache (56.2%), and constipation (37.7%). The reliance on plant leaves and simple home preparations highlights the accessibility and familiarity of herbal treatments in household health care practices.

Furthermore, 93.8% of students indicated they would consult a doctor in the event of adverse reactions or overdosing, suggesting cautious and hybrid health-seeking behavior. This reflects a dual medical worldview—one that respects both traditional and modern systems—a theme noted by Lasco et al. (2025) among Filipino youth navigating pluralistic healthcare environments.

However, only 15.8% of respondents reported using herbs with specific dosages, and 41.1% admitted to no standardized measurement at all. This indicates a critical need for education on dosage, preparation methods, and potential toxicity. Such findings reveal a key instructional gap: students lack the skills to translate cultural practices into quantifiable, testable, and safe procedures—skills central to scientific and STEM learning.

Table 4. The Extent of Herbal Medicine Prevalence and Usage among the Participants

Question	Answer	Frequency (n=146)	Percentage
Have you ever (even once in your life) used herbs?	Yes	138	94.5
	No	8	5.5
When was the last time you used herbs?	Every day	3	2.1
	Two days ago, or less	3	2.1
	A week or less ago	9	6.2
	A month or less ago	48	32.9
	Six weeks ago, or less	83	56.8
What is the frequency of your use of herbs?	Daily	4	2.7
	Weekly	5	3.4
	Only when needed	119	81.5
	No answer	18	12.3

Table 4. (Cont')

Question	Answer	Frequency (n=146)	Percentage
Does your use of herbs have specific doses?	Yes	23	15.8
	No	60	41.1
	Sometimes	45	30.8
	No answer	18	12.3
What kind of herbs do you use?	Leaves	135	92.5
	Seeds	12	8.2
	Roots	30	20.5
	Other	13	8.9
How do you use herbs?	In the form of a drink or eaten	108	74
	External use	85	58.2
	Other	8	5.5
What is the reason for your use of herbs?	Enhance Health	60	41.1
	Treatment of diseases	115	78.8
	Cosmetic	8	5.5
	Enhance physical functions	24	16.4
	Other	13	8.9
What do you feel after using herbs?	Better	115	78.8
	Worse	0	0
	No change	18	12.3
	Other	13	8.9
	Better	115	78.8
	Friends and colleagues	2	1.4
	Herbs shops	3	2.1
	Websites	1	0.7
	Herbalists	2	1.4
	Other places	10	6.8
What will you do if you have a side effect because of your use of a large dose of herbs during treatment or use?	Treated with another herb	4	2.7
	Go to the doctor	137	93.8
	Other	5	3.4
What are the most common cases where herbs are used?	Fractures	22	15.1
	Diabetes	22	15.1
	Hypertension	26	17.8
	Fever	87	59.6
	Malaria and infectious diseases	24	16.4
	Headaches	82	56.2
	Constipation	55	37.7
	Other	42	28.8
At what times does a person often use herbs?	Before a health exposure	9	6.2
	During a health exposure	117	80.1
	After a health exposure	20	13.7
Do you go to the doctor once you have the disease or depend on the herbs first?	Go to the doctor	89	61
	Use herbs	46	31.5
	Other	11	7.5
Is there anyone who uses herbs for the purpose of medication in your family?	Yes	109	74.7
	No	37	25.3
Is there anyone who uses herbs for the purpose of medication from your friends or colleagues?	Yes	68	46.6
	No	78	53.4

Table 4. (Cont')

Question	Answer	Frequency (n=146)	Percentage
Do you advise others to use herbs?	Yes	107	73.3
	No	39	26.7

3.4 Instructional Gaps and Needs for STEM-Based Lesson Development

Across the knowledge, perception, and prevalence domains, several instructional gaps emerged. First, students lacked foundational scientific understanding of THM mechanisms, including active compounds, toxicity, and dose-response relationships. Second, students relied heavily on familial and digital information channels rather than academic or biomedical sources. Third, students lacked structured opportunities for evidence evaluation and scientific argumentation regarding health claims. Collectively, these gaps indicate the need for STEM lessons that contextualize THM within biological, chemical, and health science frameworks, while bridging cultural knowledge and scientific reasoning.

Adolescents represent a critical demographic for examining THM knowledge and practice due to their developing scientific reasoning capacities and exposure to both informal cultural knowledge and formal schooling. Existing studies indicate that youth typically possess favorable perceptions of herbal remedies, viewing them as affordable, natural, and culturally legitimate, yet demonstrating limited knowledge about pharmacological mechanisms, dosage, efficacy, contraindications, and herb–drug interactions (Xie et al., 2020; Alshahrani, 2024; Zakeri et al., 2025; Chaachouay, 2025). Such gaps underscore the need not only for public health education but also for the integration of culturally situated health topics into science and STEM education.

From a STEM education standpoint, scholars have argued for curricular designs that promote scientific literacy, critical evaluation of claims, and informed decision-making, particularly in health-related contexts (Arnold & Bauer, 2021; Zeyer & Dillon, 2019). Argumentation and evidence evaluation are central to modern STEM competencies and are recognized for their role in preparing learners to navigate socioscientific issues, including those related to traditional medicine. However, Philippine science curricula rarely address THM explicitly, resulting in a disconnect between students' lived cultural experiences and formal scientific learning.

Design-Based Research (DBR) has emerged as a rigorous methodological framework for developing educational innovations situated in authentic contexts (Hall, 2020, Tinoca et al., 2022). DBR emphasizes iterative design, empirical testing, and refinement of instructional materials in partnership with local stakeholders. For culturally mediated topics such as THM, DBR provides an avenue for aligning cultural relevance with disciplinary rigor.

These findings align with the WHO (2019) framework emphasizing education's role in ensuring the safe, informed use of traditional medicines. By transforming students' implicit cultural knowledge into explicit scientific understanding, STEM education can promote culturally grounded yet scientifically sound perspectives on health and medicine.

4. Conclusion and recommendations

This needs assessment reveals that while high school students in Iligan City hold positive perceptions of traditional herbal medicine, their understanding of its scientific basis and safe use remains limited. The findings point to the need for educational interventions that enhance knowledge of herbal pharmacology, safety protocols, and the interplay between traditional and modern medicine. As such, integrating herbal medicine concepts into the STEM curriculum can bridge cultural knowledge and scientific inquiry, promoting both health literacy and cultural preservation.

The findings recommend that:

- Qualitative component (Phase 2, e.g., focus group interviews) to explore why students trust family sources more than formal education. This will ensure the final STEM lesson design is truly Culturally Responsive.
- Develop a STEM-based lesson or module focusing on the science of herbal medicine, including plant identification, active compounds, and safety evaluation.
- Incorporate ethnobotany into existing biology or chemistry units to contextualize scientific concepts within local culture.
- Provide teacher training workshops on developing inquiry-based lessons that integrate traditional and scientific knowledge.
- Collaborate with local herbalists and health professionals to ensure content accuracy and cultural sensitivity.
- Encourage student research projects on local medicinal plants to foster environmental awareness and scientific curiosity.

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