



FOSTERING CULTURAL AWARENESS AMONG UNDERGRADUATE STUDENTS IN CHEMISTRY EDUCATION THROUGH FOLK LITERATURE

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ABSTRACT

This paper explores the educational significance of folk literature in fostering chemistry learning. Regardless of our backgrounds and locations, chemistry pervades every aspect of our lives, enhancing our lifestyles and shaping the world we inhabit (Brown, 2005). Folk literature, also known as folklore, transcends written language, encompassing dramas, rituals, fairy tales, riddles, poems, and songs. Numerous studies indicate that folk literature, including riddles, proverbs, and folk songs, is conducive to acquiring knowledge, honing skills, and fostering various intellectual capabilities and affective outcomes, such as cultivating interest and instilling positive attitudes toward science, especially in children. Integrating folk literature into chemistry education promises to make concepts more accessible and engaging. This approach imbues education with an informal, relatable quality, offering a lens into cultural practices, family dynamics, societal structures, and traditional values inherent in the folk culture of regions like Kerala. This study endeavors to explore how folk literature, especially proverbs can enrich chemistry education and contribute to heightened cultural awareness among undergraduate students.

Key words : Folk literature, Cultural Awareness, Undergraduate Students

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Introduction:-

Chemistry stands as an intriguing and essential experimental science, unveiling the mysteries of our universe while simplifying our daily lives. It serves as the cornerstone for comprehending the materials around us and their intricate functions. From the alarm clocks that rouse us each morning to the batteries powering our electronic devices, chemistry permeates our existence, shaping the objects we interact with daily. Considered the central science, chemistry bridges various natural disciplines, including astronomy, physics, biology, and geology, thereby playing a pivotal role in our understanding of the world. Its significance extends beyond mere academic pursuit; chemistry empowers individuals to explore new frontiers and innovate, driving progress and advancement in society.

In the realm of education, the essence of scientific learning lies not only in rote memorization but in nurturing critical thinking and fostering a scientific mindset. Science education, particularly in India, holds a dual objective: instilling a scientific temperament and equipping individuals with practical skills for problem-solving. By cultivating a spirit of inquiry and rationality, science education empowers individuals to evaluate information critically and discern fact from conjecture. Moreover, it provides them with the conceptual framework and analytical tools necessary to navigate the complexities of modern life and contribute meaningfully to society's progress. As science continues to shape our world, the role of chemistry in the curriculum remains indispensable, serving as a gateway to understanding fundamental principles and unlocking doors to new discoveries and innovations.

Importance of folk literature in teaching chemistry

Folk literature, also known as traditional literature, comprises a rich tapestry of tales transmitted orally from one generation to the next. This oral tradition encompasses a diverse array of narratives, including myths, legends, folk tales, and anecdotes, among others. Passed down through the ages, folk literature serves as a repository of cultural heritage and collective wisdom, reflecting the values, beliefs, and experiences of a community.

Incorporating folk literature into the teaching of chemistry holds immense value as it bridges the gap between abstract scientific concepts and real-world contexts, making learning more accessible and engaging for students. Proverbs, myths, and folk tales offer vivid illustrations and analogies

that not only elucidate complex chemical phenomena but also imbue lessons with cultural relevance, fostering deeper understanding and appreciation for the subject. By weaving elements of folk literature into the curriculum, educators can stimulate curiosity, promote critical thinking, and instill a sense of cultural awareness among students, thereby enriching the educational experience and nurturing well-rounded learners.

In the realm of education, conventional methods such as the activity, demonstration, and lecture approaches are commonly employed to impart instruction in subjects like chemistry. However, the heterogeneous nature of the classroom poses challenges, as these traditional methods may not cater to the diverse learning needs of all students. Despite this, the educational significance of folk literature, particularly proverbs, cannot be overstated. Proverbs, with their profound insights and practical wisdom, offer a valuable resource for enhancing learning experiences and fostering deeper understanding among students. Their timeless relevance and universal appeal make them a rich source of cultural insight and practical knowledge, enriching the educational landscape with their depth and breadth of wisdom.

Objectives of the Study

1. To explore the potential of folk literature, especially proverbs as a tool for fostering cultural awareness among undergraduate students in chemistry education.
2. To test the effectiveness of folk literature, especially proverb integrated teaching in enhancing Cultural Awareness in Chemistry among Undergraduate Students.

Hypothesis of the Study

1. Undergraduate students exposed to folk literature; especially proverb integrated teaching will demonstrate greater cultural awareness in science compared to those who receive traditional instruction.

Variables in the study

Independent Variables- a) Teaching Chemistry with folk literature; especially proverbs

b) Teaching Chemistry through Lecture - Demonstration method

Dependent Variable - (a) Cultural Awareness in the context of Chemistry

Methodology in brief

Design and Method

The investigator adopted Experimental Method for the present study. The design for experiment is Non Equivalent pretest – post test, control group design (Kenny, 1975)

Population and Sample

The Population of this Study consisted of Undergraduate Students who have selected Chemistry as their Main subject.

For the Experimental study, 118 Undergraduate students who selected Chemistry as their main subject (60 for the Experimental Group and 58 for the Control Group) were randomly selected using the Simple Random Sampling technique.

Materials and Tools used for the Study

1. Lesson Transcripts in Chemistry with folk literature; especially proverbs
2. Lesson Transcripts on Lecture -Demonstration method
3. Cultural Awareness Scale in Chemistry

Proverbs

Proverbs serve as insightful expressions of societal wisdom, reflecting the values and beliefs of a community. In Malayalam culture, proverbs abound, offering rich insights into the social fabric. Here, we explore selected proverbs and their connections to various concepts in chemistry.

Onnu cheengal mattonninu valam. ഒന്ന് ചീഞ്ഞാൽ മറ്റൊന്നിനു വളം (The decomposition of one plant is favourable for the growth of another plant).

This proverb emphasizes the significance of the biogeochemical cycle.

The circular pathway of material cycling from the organism's environment back to the environment is termed the biogeochemical cycle. Essential for plant growth are certain elemental components such as N₂, P, K, and S, along with organic matter. These organic materials are sourced from the soil through the decomposition of humus. Humus, formed by the gradual decomposition of fresh and dried leaves that accumulate on the ground, serves as a natural fertilizer. It proves to be a valuable medium for nurturing seedlings and promoting root growth.

2. Gold won't sound bronze sounds. സ്വർണ്ണം വെങ്കല ശബ്ദങ്ങൾ മുഴക്കില്ല

This proverb underscores the chemical stability of gold and the resonant properties of bronze.

Gold, known for its inertness, is highly valued for its resistance to chemical corrosion from heat, moisture, CO₂, and most acids. Bronze, an alloy of copper and tin, is distinguished by its sonorous nature, producing a ringing sound. This quality makes it ideal for crafting bells. While gold is typically resistant to chemical reactions, it can be dissolved in a solution known as aqua regia,

formed by mixing concentrated nitric acid and concentrated hydrochloric acid in a 1:3 ratio, respectively.

3.Oil and water don't mix എണ്ണയും വെള്ളവും കലരുന്നില്ല

This proverb underscores the significance of emulsions in the mixing of oil and water.

When oil and water are shaken together, they form an emulsion, which is a colloidal system where both the dispersed phase and dispersion medium are typically liquids. Emulsions come in two types: oil in water and water in oil. Shaking together two immiscible liquids like oil and water results in a milky solution, forming small oil globules suspended in water, which is highly unstable. Over time, the two liquids will separate unless an emulsifying agent is added. Mustard powder, for instance, can be added and stirred to form a stable emulsion that remains mixed. Emulsifying agents are substances added to achieve stable emulsions.

4. Diamond cuts diamond ഡയമണ്ട് വെള്ളം മുറിക്കുന്നു

This proverb underscores the exceptional hardness of diamonds.

Comprised entirely of carbon, diamonds possess strong covalent bonds, rendering them the hardest known substance. Diamond's structure consists of carbon atoms that are SP₃ hybridized, forming a rigid 3-D network. A perfect diamond exhibits absolute colorlessness and is a non-conductor of electricity due to its crystalline structure.

5. All the glitters is not gold. മിനുനതെല്ലാം സ്വർണ്ണമല്ല.

This proverb highlights the distinctive metallic luster of gold.

Gold is characterized by a metallic bond, wherein metal ions are bound to a number of electrons within their spheres of influence. The brilliant metallic luster of gold arises from the presence of highly mobile electrons. Metals can be conceptualized as arrangements of positive ions surrounded by a sea of electrons, reflecting the prevalence of metallic bonds. The remarkable metallic luster exhibited by gold is attributed to the mobility of its valence electrons, contributing to its high electrical and thermal conductivity.

6. Grapes one Sour മുന്തിരിക്ക് പുളിയുണ്ട്

This proverb emphasizes the sour taste of grapes.

Grapes, like tamarind, contain tartaric acid, which imparts their sour flavor. Wine, a product derived from grapes, is obtained through fermentation. Fermentation is the gradual decomposition of complex organic compounds into simpler compounds facilitated by enzymes.

7. Both milk and butter milk are white. പാലും വെണ്ണ പാലും വെളുത്തതാണ്

This proverb emphasizes the white color of milk and the changes it undergoes when it becomes sour.

The white color of milk is attributed to the scattering of light by colloidal particles of protein and fat dispersed in milk. Milk is an emulsion wherein fat globules are dispersed in water. Emulsions are colloidal systems where both the dispersed phase and the dispersion medium are liquids. The souring of milk into curd occurs through fermentation, where bacteria present in milk convert milk sugar into lactic acid. The sour taste of curd is a result of this lactic acid formation.

8. The bitter taste of kanjiram cannot be changed even if it is kept in milk for a long period. കാഞ്ഞിരത്തിന്റെ കയ്പ് ഏറെക്കാലം പാലിൽ സൂക്ഷിച്ചാലും മാറില്ല.

This proverb underscores the bitter taste of the seeds of *Strychnos nux vomica*.

The bitterness of *Strychnos nux vomica* seeds is attributed to the presence of the alkaloid strychnine. Strychnine, with a molecular formula of $C_{21}H_{22}O_2N_2$, is highly toxic and colorless.

9. Words of older people as well as gooseberry taste bitter first but later they will be Sweeter. പ്രായമായവരുടെയും നെല്ലിക്കയുടെയും വാക്കുകൾക്ക് ആദ്യം കയ്പ് തോന്നുമെങ്കിലും പിന്നീട് അത് മധുരമായിരിക്കും.

This proverb highlights the dual taste experience of gooseberry - bitterness and sweetness.

When consuming gooseberry, the polyphenolic compounds present in it temporarily hinder the functioning of taste buds, resulting in a bitter taste sensation. However, upon drinking water after consuming gooseberry, these polyphenolic compounds are washed away, allowing the taste buds to regain their normal functioning. As a result, the original sweetness of gooseberry, attributed to the presence of saccharin, becomes perceivable once again.

Data Analysis

To test the effectiveness of the folk literature, especially proverb integrated teaching in enhancing Cultural Awareness in Chemistry among Undergraduate Students.

The scores of Cultural Awareness Scale were analysed statistically by using ANCOVA to determine the effectiveness of the folk literature, especially proverb integrated teaching in enhancing cultural awareness among undergraduate students.

To compare the extent of cultural awareness of the experimental and control groups, Mean and SD of both pretest and post test scores were found out. The details are given in table 1

Table 1 Mean and SD of scores in Cultural Awareness Scale of Pre and Post tests of Undergraduate Chemistry students in Experimental and Control groups.

Test	Group	N	Mean	SD
Pretest	Experimental	60	100.47	0.21
	control	58	101.26	0.35
Posttest	Experimental	60	325.17	0.32
	control	58	106.31	2.18

Table 1 shows that the mean of experimental group in the post test (M=325.17) was higher than that of control group (M=106.31). Also, while comparing the Pretest and Posttest scores of experimental groups, the mean of Posttest of experiment group was also higher than the mean of Pretest.

In order to find out whether the difference in the

test scores is significant, the adjusted mean scores obtained by these groups in both tests were compared using the technique of Analysis of Covariance (ANCOVA) and the obtained F value was tested for significance by taking the pre-test as the covariate. The results of the analysis are given in table 2

Table 2 Summary of ANCOVA of Cultural Awareness scores in pre and posttests of students in the experimental and control groups.

Test	Source	Sum of Squares	df	Mean Squares	F-ratio
Pretest	Pt Cultural Awareness	0.84		0.84	5.35
	Between Groups	65.377	1	65.377	
	Within Groups	1405.79	116	12.22	
	Corrected Total	3061.13	117		
Posttest	Pt Cultural Awareness	0.04		0.04	42.77**
	Between Groups	724.18	1	724.18	
	Within Groups	1964.32	116	16.93	
	Corrected Total	8015.56	117		

**significant at 0.01 level

From Table 2, the obtained F-ratio for the Between Groups is 5.35 ($F(1,116) = 5.35, p < 0.01$) in the pretest. This shows that the mean difference between experimental and control group is not statistically significant. In the post test, the obtained F-ratio for the between groups is 42.77 ($F(1,116) = 42.77, p < 0.01$) which clearly reveals that the mean difference between experimental and control group is statistically significant in the post test. It can therefore be

concluded that folk literature, especially proverb integrated teaching is effective in enhancing Cultural Awareness in Chemistry among Undergraduate students.

Again, to compare the extent of cultural awareness of the experimental and control groups, mean and standard deviations of both post test scores and retention test scores were found out. The details are given in Table 3

Table 3 Mean and SD of scores in Cultural Awareness Scale of Post and Retention tests of Undergraduate Chemistry students in Experimental and Control groups.

Test	Group	N	Mean	SD
Posttest	Experimental	60	325.17	0.32
	Control	58	106.31	2.18
Retention test	Experimental	60	301.21	0.13
	Control	58	103.53	1.21

From Table 3, it is clear that the mean of experimental group in the post test (325.17) is higher than that of the control group (106.31). The table also shows that in the retention test, the mean of experimental group (301.21) was again higher than that of the control group (103.53). Table 3 reveals that the mean scores of experimental group in both the post and retention tests were higher than those of the control group.

In order to find out whether the difference in the test scores is significant, the adjusted mean scores obtained by these groups in both the tests were compared using the technique of Analysis of Covariance (ANCOVA) and the obtained F-value was tested for significance. The pre-test was the covariate. The results of the analysis are given below in Table 4

Table 4 Summary of ANCOVA of Cultural Awareness scores in post and retention tests of students in the experimental and control groups.

Test	Source	Sum of Squares	df	Mean Squares	F-ratio
Posttest	Pt Cultural Awareness	0.04		0.04	42.77**
	Between Groups	724.18	1	724.18	
	Within Groups	1964.32	116	16.93	
	Corrected Total	8015.56	117		

	Corrected Total				
Retention Test	Rt Rt Cultural Awareness	0.63		0.63	
	Between Groups	923.64	1	923.64	46.55**
	Within Groups	2301.67	116	19.84	
	Corrected Total	8245.19	117		

**significant at 0.01 level

Table 4 indicates that, in the post test, the obtained F-ratio for the Between Groups is 42.77 ($F_{(1,116)} = 42.77$, $p < 0.01$). This shows that the mean difference between experimental and control group is statistically significant. In the retention test, the obtained F-ratio for the between groups is 46.55 ($F_{(1,116)} = 46.55$, $p < 0.01$) which again reveals that the mean difference between experimental and control group is statistically significant even in the retention tests. It can therefore be concluded that the folk literature, especially proverb integrated teaching is effective in enhancing Cultural Awareness in Chemistry among Undergraduate students.

Findings of the Study

1. Folk literature, especially proverb integrated teaching is effective in enhancing Cultural Awareness in Chemistry among Undergraduate Students
2. Folk literature, particularly proverbs, is an effective tool for fostering cultural awareness among undergraduate students in chemistry education.
3. Folk literature, especially proverb integrated teaching is more effective than the Lecture - Demonstration method in enhancing Cultural Awareness in Chemistry among Undergraduate Students

Educational Implications

This study underscores the significance of integrating folk literature into chemistry education as a means to foster cultural awareness among undergraduate students. The findings suggest that incorporating folk literature in chemistry curricula can enhance students' understanding of cultural perspectives in science, promote engagement and motivation, and contribute to a more inclusive learning environment.

Through the exploration of folk literature, students are exposed to diverse cultural narratives, values, and knowledge systems that intersect with scientific concepts. This exposure not only enriches their understanding of chemistry but also broadens their worldview and cultivates empathy and respect for different cultural traditions.

Moreover, the study highlights the importance of incorporating culturally relevant pedagogical approaches in science education to address the needs and interests of diverse student populations. By embracing folk literature as a tool for teaching and learning, educators can create meaningful connections between science and culture, fostering a deeper appreciation for the interconnectedness of knowledge across disciplines.

Moving forward, further research is needed to explore the long-term impact of integrating folk literature into chemistry education and to identify effective strategies for implementation. By continuing to innovate and adapt instructional practices, educators can empower students to become culturally competent and socially responsible scientists, capable of addressing global challenges with sensitivity and insight.

Conclusion

Chemistry is a discipline of science concerned with the study of matter including its structure, composition and changes that occur when it is exposed to various situations. As a result, chemistry not only investigates the qualities of matter but also how and why it changes. Both folklore and literature are parts of culture, produced or created by cultural beings. Their study expands our knowledge of its makers and possessors- their creative processes and strategies, their material's function. The diversity of India's cultures ensures a wide and complex range of folk literature that helps to maintain our traditional language and customs from different regions, religious and social groups, and tribes. This folk literature is connected to chemical concepts. That connection will help us to study chemistry in a more interesting way.

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