

ASSESSMENT OF CURRENT STATUS OF HANDS ON, MINDS ON AND HEARTS ON ACTIVITY DURING SCIENCE SESSION: THE CASE OF PRIMARY SCHOOLS IN WOLDIA TOWN

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ABSTRACT

The study was conducted to assess the status of hands on, minds on and hearts on activity during science session and students' attitude towards science subject at full cycle primary schools in Woldia Town. For this study descriptive survey approach was applied and four scaled items questionnaire was employed for 425 students, observation of lab rooms and unstructured interview was employed for laboratory assigned teachers to triangulate the responses of the students. Accordingly, the results indicated that, large number of participants in this study did not have positive attitude towards science. Only 62.34% of the respondents had positive attitude towards science subjects while 37.66% of the respondents do not have positive towards science subjects. Likewise, only 50.51% of students indicated that they were satisfied with the method of learning science subjects (hands on, minds on and hearts on activities) while 49.49% indicated that the students were not satisfied with the method of learning science subjects (lack of hands on, minds on and hearts on activity during science class). In relation to the availability of adequate laboratory 53.92% of the students indicated that the school laboratory was not appropriate for science teaching while 46.08% responses indicated the laboratory supports science teaching. The data obtained from the questionnaire was confirmed by unstructured interview and observations). In view of conclusion, the method of teaching science associated with the lack of hands on, minds on and hearts on activity and the attitudes of the students did not have sound in Woldia Town full cycle primary schools. The schools should be evaluated to improve the students' academic result in related to cognitive, psychomotor, and affective educational domains. [African Journal of Chemical Education—AJCE 12(2), July 2022]

INTRODUCTION

Background of the study

Nowadays quality education in schools has been a topic of discussion everywhere in the globe. Quality education is a system of learning that produces well educated individuals who can handle matters of concern within their area of study proficiently [1]. For a country to develop, it must have adequate human capital to do so. The human capital is obviously obtained through sound education. It is believed that education is a pivotal part of human development, and can positively influence standards of living, health, and governance.

Education, particularly science and technical education, is the ‘driving force’ to turn the nation’s economy around and usher in the desired technological advancement. Acquisitions of appropriate scientific and technological skills are necessary to tackle the challenge presented by the evolving needs of modern workplace in our industries and the ever-growing non-formal sector. Science and technology are the basic tools for the developments of industries and nation as a whole [2].

Education and training systems that responds adequately to these demands will, therefore, contribute to the efforts to overcome the growing unemployment and marginalization of majority of the populace. In science teaching-learning ideas could be organized to extract the scientific

consensus model and highlight the differences between these and the students' often alternative ideas [3]. By providing access to appropriate learning experience designed to broaden skills and knowledge (hands on, minds on and hearts on activity) can increase achievement in science education and significantly improve the fortunes of the unemployed, thereby reducing poverty [4].

Science teaching is supposed to be result oriented and students centered, and this can only be achieved when students are willing and the teachers are favorably disposed, using the appropriate methods and resources in teaching science [5]. Most students are curious; they need to be actively involved in the learning process in which they are continuously equipping, testing, speculating, and building their own personal construct and knowledge. In science, students need to actively perform hands on, minds on and hearts on to construct their own personal awareness and meaning about science concepts.

“A child best learns to swim by getting into water; likewise, a child best learns science by doing science” [6]. Doing science, as opposed to simply hearing or reading about it, engages students and allows them to test their own ideas and build their own understanding [7]. Hands-on (skill based) science is defined mainly as any instructional approach involving activity and direct experience with natural phenomena or any educational experience that actively involve students in manipulating objects to gain knowledge (minds on activity) or understanding [8]. Unlike the

laboratory works, hands-on activities do not necessarily need some special equipment and special medium.

Research studies showed that hands-on activities help students to improve understanding concepts resulting in better achievements and success in science subjects and to encourage their creativity in problem solving, promote student independence, improves skills such as specifically reading, arithmetic computation, and communication [8, 9]. [10] Emphasizes that children learn better when they can touch, feel, measure, manipulate, draw, and make charts, record data and when they find answers for themselves rather than being given the answer in a textbook or lecture.

For students to truly learn science concepts, they both need practical opportunities to apply knowledge and also need help in integrating or exchanging the knowledge they gain. According to the [11], students should have minds-on and/or heads-on experiences during hands-on activities. While doing hands-on activity, the learner is learning by doing but while minds-on learning, the learner is thinking about what she or he is learning and doing. [12], State that minds-on science activity includes the use of higher order thinking, such as problem solving compared to the hands-on activity. Therefore, students should be both physically and mentally engaged in activities that encourage learners to question and devise temporarily satisfactory answers to their questions [13].

As a result of incorrect informing from the environment, in Ethiopia, a lot of students think that science is complex, difficult and this affects their outlooks to science subjects in general and

their achievement. For this reason, students' meeting science and liking science, improves positive attitudes towards science subjects. In the study area, Woldia full cycle primary schools, the method of teaching science, are associated with tremendous obstacles that inhibits effective way of teaching science. The researcher had the exposure to see the teaching method and the availability of laboratory during practicum supervision time and the school linkage program.

Therefore, the main purpose of this study is to assess the current status of hands-on (skill), minds-on (knowledge) and hearts on (attitude) activities in the study area, Woldia Town primary schools.

Statement of the problem

Science has become one of the most important disciplines in the school curriculum and its importance in general education has gained worldwide recognition [14]. The science laboratory has become a distinctive feature of science education.

Plainly the only way to learn about such remarkable kinds of action is to see the results by conducting experiments, and work in the laboratory [12]. To promote deep conceptual understanding (minds on), science skill (hands on) development, and positive attitudes toward science (hearts on), it is recommended that science teaching and learning should be focused on the use of scientific reasoning and experimental procedures to investigate real-life phenomena [15]. Hands on activities are variety of activities which allow students to handle, manipulate, and

observe scientific processes. Such activities may or may not be done in actual laboratories and allows for learners to interact with materials and equipment (good article).

Despite the importance of attitude and incorporating hands on, minds on and hearts on activities in teaching science, there are tremendous obstacles to do these in Woldia Town primary schools. The researcher had the exposure to see the teaching method and the availability of laboratory during practicum supervision time and the school linkage program. The researcher also had the chance to talk with some science teachers and explore their ideas towards the attitude of the students about science subjects. These conditions initiated the researcher to conduct research to assess the status of hands on, minds on and hearts on activities in terms of the following research questions.

1. Do the students have positive attitudes towards science subjects?
 2. Do teachers use different methods in teaching science that motivate the students' hands on, minds on and hearts on activity?
 3. To what extent the schools' laboratory are available to encouraging students' hands on, minds on and hearts activities to the science subjects?
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Operational definition

Hands on activity: it is a method of learning by doing. In science class it is defined as any science activity that allows the student to handle, manipulate or observe a scientific process to enhance critical thinking ability (psychomotor domain of learning).

Minds on activity: it is a mind-based activity associated with critical thinking ability of the students (cognitive domain of learning).

Hearts on activity: it is the activity associated with the feelings of the students (affective domain of learning).

METHODOLOGY

Design of the study

The main purpose of this study was to assess the status of hands on, minds on and hearts on activity of science subjects teaching in Woldia Town full cycle primary schools. In order to achieve the goal of this study, descriptive survey approach was used. Descriptive survey helps to have general understanding of the problem by studying the status of the problem.

Samples and Sampling Techniques

In Woldia Town there are eight full cycle primary government schools. Among these schools four government schools were selected using simple random sampling method and from these four school 425 students out of 3119 were selected as a source of information.

Data Collecting Tools

To obtain the necessary data, adapted closed ended questionnaire, unstructured interview and observational check list were developed and used.

Questionnaire: - Closed ended questionnaires were adapted with an English language and then translated into the local language, Amharic language, with the aid of two language college instructors to make effective and easy communication with participants [16]. And finally, the questionnaires were turned into English language to make easy for the scientific community. The questionnaire has four parts with a total of 47 items with four rating scale of matrix type. In that case strongly disagree is represented by 1, disagree is by 2, agree is by 3 and strongly agree is by 4. The researcher intentionally excluded the undecided option to motivate the student to decide.

Interview: unstructured interview was developed and provided for 4 laboratory assigned teachers.

Observation: the researcher did observation of laboratory rooms, students' activity so as to consume some information.

Validity and Reliability

The data collecting instruments were given for two college chemistry lecturers and two schoolteachers to check face validity and content validity against leading questions and few adjustments were done to increase the reliability of the questionnaire.

Data Treatment Techniques

The questionnaires obtained from the respondents were treated using Q-test in order to check whether any of the data was outlier or not. After collecting all the response of the respondent, the data was treated with Dixon outliers. Among 425 responses of the student 12 responses were incomplete and 13 responses were rejected with Dixon outliers using the following mathematical equations.

$$Q_{\text{cal}} = \frac{x_2 - x_1}{x_n - x_1} \quad \text{where } x_1 = \text{the smallest expected value (lower outlier)}$$

and

$$Q_{\text{cal}} = \frac{x_n - x_{n-1}}{x_n - x_1} \quad X_n = \text{next to the expected smallest value}$$

$X_n = \text{the largest expected value (upper outlier)}$

Principally, $Q_{cal} > Q_{crt}(\alpha, v)$, the suspected outlier could be rejected while the $Q_{cal} < Q_{crt}(\alpha, v)$ the suspected outlier is retained. By this treatment 13 data were rejected and the rest 400 were retained at 95% confidence (i.e. at α value of 0.05) which makes response rate was 94.12%.

Data analysis techniques

To analyze the data both quantitative and qualitative techniques (mixed approach) were used. The quantitative analysis was used to assess the targeted variables using statistical tests /like percentage, mean / and the qualitative analysis, obtained from the interview and observation were narrated to triangulate the information gathered through questionnaire.

DATA ANALYSIS AND INTERPRETATIONS

In this part, results obtained from the questionnaires, observation and interviews were presented qualitatively and quantitatively. The data were analyzed using descriptive statistics (mean and percentage), graphs and tables.

Table 1

Students' Response about Their Attitudes towards Science Subject

Items	Strongly disagree		Disagree		Agree		Strongly agree		T
	Fre	%	Fre	%	Fre	%	Fre	%	F
I am happy during science class	15	3.75	46	11.5	185	46.25	154	38.5	4
I know the importance of science education	0	0	30	7.5	143	35.75	227	56.75	4
I love science teachers	78	19.5	76	19	107	26.75	139	34.75	4
I don't want to study science subjects(R)	138	34.5	105	26.3	141	35.25	16	4	4
The science in school is not related to my everyday life(R)	30	7.5	16	4	215	53.75	139	34.75	4
I understand the science concepts when science teacher teaching science	0	0	46	11.5	201	50.25	153	38.25	4
I am interested with science homework	15	3.75	92	23	153	38.25	140	35	4
Science teacher appreciate me when I did my tasks	41	10.25	46	11.5	168	42	145	36.25	4
I have a good understanding of basic concepts in science	122	30.5	46	11.5	154	38.5	78	19.5	4
I try to learn about science on my own.	141	35.25	106	26.5	78	19.5	75	18.75	4
Science classes have increased my interest in science	141	35.25	148	37	71	17.75	40	10	4
I am able to easily understand topics in science	202	50.5	78	19.5	75	18.75	45	11.25	4
I don't enjoy talking about science with my friends(R)	62	15.5	138	34.5	140	35	60	15	4
Grand Mean/average	985	18.94	973	18.72	1831	35.21	1411	27.13	5

R= Items that were reversely scored

Category type	Disagree	Agree
Grand mean/average	37.66%	62.34%

As it indicated in the above Table 1, most of the responses of the students indicated that their attitudes towards science subject is not far from the average. The mean percent for strongly agree is 27.13%, the mean percent for agree is 35.21%, which makes the aggregate agree category was 62.34%. The mean percent for disagree is 18.72% and the mean percent for strongly disagree is 18.94% which makes an aggregate category of disagree response was 37.66%.

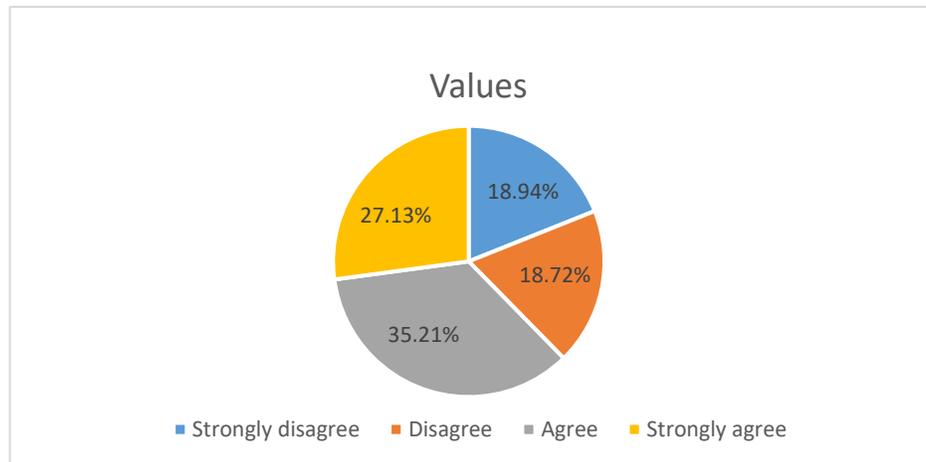


Figure 1. Students' Response about Their Attitude towards Science Subject.

The grand mean percent for the agree category is 62.34%, based on the question given to them, they react in satisfaction manner about their attitude of science subjects. The disagree category overall mean was 37.66%.

Table 2. Students' Response about Method of Learning Science Subject

Table 2.1. Responses Related to Hands on Activity

Items	Strongly disagree		disagree		Agree		Strongly disagree	
	Fre	%	Fre	%	Fre	%	Fre	%
1. During science class, we conduct different practical activities in groups	107	26.75	141	35.25	60	15	92	23
2. Classroom science teaching is mainly associated with practical activities	108	27	107	26.75	91	22.75	94	23.5
3. Science teacher motivated us to do different practical activities	120	30	108	27	126	31.5	46	11.5
4. I enjoy laboratory activities in science class	107	26.75	153	38.25	61	15.25	79	19.7
5. Our science teacher directed us to construct different activities from locally available materials	146	36.5	143	35.75	64	16	47	11.7
6. during science class different activities in the lab were done	62	15.5	91	22.75	125	31.25	122	30.5
7. I know how different activates can be done in the laboratory	192	48	118	28.5	69	17.25	24	6
8. Classroom Science teaching incorporate practical activity which makes me interested	122	30.5	46	11.5	154	38.5	78	19.5
9. Science teachers rely primarily on lectures as a teaching method(R)	158	39.5	123	30.75	59	14.75	60	15
Grand mean/average	1202	33.39	1027	28.53	783	21.75	588	16.3

R= items that were reversely scored

Category type	Disagree	Agree
Grand mean/percentage	61.92%	38.08%

The grand mean percent for the agree category is 38.08% while the disagree category overall mean was 50.79%.

Table 2.2. *Students’ Response Related to Their Hearts on Activity*

Items	Strongly disagree		Disagree		Agree		Strongly disagree	
	Fre	%	Fre	%	Fre	%	Fre	%
1. Science is too complicated for most students to understand.	63	15.75	77	19.25	152	38	108	27
2. I learn science best when I can do labs or activities.	45	11.25	45	11.25	139	34.75	171	42.75
3. The science in school is not related to my everyday life(R)	108	27	92	23	62	15.5	138	34.5
4. I like to share what I’ve learned in science class with my friends or family.	62	15.5	91	22.75	125	31.25	122	30.5
5. I enjoy learning science with practical activities	110	27.5	139	34.75	91	22.75	60	15
6. I am happy with my science teacher because he/she focused on theoretical concepts rather than practical activities	62	15.5	138	34.5	140	35	60	15
7. Science teacher motivated us to use locally available materials to conduct simple experiments	106	26.5	92	23	124	31	78	19.5
8. I do not enjoy doing labs in my science class(R)	171	42.75	145	36.25	39	9.75	45	11.25
9. I am learning science only with taking notes which makes me board	30	7.5	16	4	215	53.75	139	34.75
Grand mean	757	21.03	835	23.19	1087	30.19	921	25.5

Category type	Disagree	Agree
Grand mean/percentage	44.22%	55.78%

The grand mean percent for the agree category is 55.78%, while the disagree category overall mean was 44.22%.

Table 2.3. *Students’ Response Related to Minds on Activity*

Minds on activity	Strongly disagree		Disagree		Agree		Strongly disagree	
	Fre	%	Fre	%	Fre	%	Fre	%
1 . I am learning science by taking note from the textbook	169	42.25	77	19.25	61	15.25	93	23.25
2 . I am learning science by taking note from the blackboard	77	19.25	63	15.75	152	38	108	27
3 . Class work, group work and homework are usually given us in science subjects.	110	27.5	139	34.75	91	22.75	60	15
4 . Teachers briefly discussed science concepts during the teaching-learning process	45	11.25	45	11.25	139	34.75	171	42.75
5 . During science class brainstorming approach helps us to analyze the science concepts	92	23	61	15.25	139	34.75	108	27
6 . science teacher designed different teaching method to increase the students understanding	124	31	77	19.25	61	15.25	138	34.5
7 . Learning things in science is easy for me	108	27	92	23	62	15.5	138	34.5
8 . I have low understanding with science subjects’ laboratory activities	108	27	92	23	61	15.25	139	34.75
9 . We learnt science without the aid of laboratory activities	92	23	30	7.5	108	27	170	42.5
Grand mean	925	23.62	676	18.72	874	25.41	1125	32.5
Category type	Disagree				Agree			
Grand mean/percentage	42.34%				57.66%			

The grand mean percent for the agree category is 57.66%, while the disagree category overall mean was 42. 34%.

Summary table

Activity type	Disagree	Agree
Hands on	61.92%	38.08%
Minds on	42.34%	57.68%
Hearts on	44.22%	55.78%
Grand mean/average	49.49%	50.51%

Table 3. Students’ Response Related to School laboratory for learning science

Items	Strongly disagree		disagree		Agree		Strongly disagree	
	Fre	%	Fre	%	Fre	%	Fre	%
The school has laboratory facilities to support the teaching of science subjects	107	26.75	141	35.25	60	15	92	23
The school laboratories have chemicals and apparatus	161	40.25	107	26.75	85	21.25	47	11.7
There is no Basic Science laboratory in the school(R)	45	11.25	32	8	200	50	123	30.7
We are engaged in the laboratory by our teachers	107	26.75	153	38.25	61	15.25	79	19.7
The teachers carried out different activities using locally available materials in the lab	30	7.5	16	4	215	53.75	139	34.7
In each science subject, we do have lab session at least one period per week	196	49	97	24.25	61	15.25	46	11.5
The lack of chemicals and apparatus affected us to conduct practical activities	107	26.75	153	38.25	61	15.25	79	19.7
Grand mean	843	30.67	699	23.25	703	26.79	555	19.2

R= Items reversely scored

Category type	Disagree	Agree
Grand mean/percentage	53.92%	46.08%

The grand mean percent for the agree category is 46.08% (1258 response out of 2800 responses) while the disagree category overall mean was 53.92% (1542 responses out of 2800 responses).

Result obtained from the observation and unstructured interview

The result obtained from these instruments were mainly the following: the students do not strong positive attitude towards the science subjects, the schools don’t have adequate laboratory, even though the schools assigned laboratory rooms without any standard there were not appropriate

chemicals and apparatuses, the inadequacy of laboratory affects the teaching-learning process by dispassionate both the teachers and the students to do hands on, minds on and hearts on activities.

DISCUSSIONS

The first research question was answered by analyzing the students' response given in Table 1. As it indicated in the table, most of the responses for the attitude of the students towards science subject are not far from the average. Research indicated that students' attitude and academic achievement exerts a strong relationship, the existence of positive attitudes enhanced the academic achievements of the students [17]. According to [18], there are stronger relationships between the variables of positive attitude towards science and students results as plausible values of science. As the results of this study indicated that, in the study area only 64.7% of the students have positive attitude towards science subject and the rest 35.3% do not have positive attitudes towards the science subject which in turn affects the overall achievements science subjects.

The second research question was answered by interpreting the students' response given in Table 2. The second questions invite to explore hands on, hearts on and minds on activities which were indicated in Table 2.1, 2.2 and 2.3. As the results depicted in the Table 2.1, most of the responses of the students for the method of learning science subjects were below the average. In the absence of differentiated teaching method, the achievements of the students could be delayed even

that would leads to below standard results. A physics metaphor described law of motion from an educationists' perspective as,

“A body at rest tends to remain at rest; a body in motion remains in motion and the brain usually follows”.

Another study indicated that science subject achievements can be improved by incorporating hands on activities which enhances the skill of inquiry [19]. [20] Described that ‘stimulating curiosity to enhance learning’ highlight that curiosity combined with the motivation to learn is more important than intelligence. Students’ curious mind fosters the learning of abstract and complex concepts. Curiosity as a desire for active learning, spontaneous exploration, and find out something which is new. The basic role of curiosity in learning is to encourage and create knowledge [21]. In teaching science hands on, minds on and hearts on activity increases the students’ curiosity which leads the students’ maturity for the required level. But the results of this study revealed that the teaching methods for science subject were not included the basic concepts of science teaching to motivate the students to be curios and passionate towards the science subject. ...

According to [22], hands-on activities are based on the use of everyday gadget, simple set-ups or low-cost items that can be found and assembled very easily. But as we have seen from the result the students’ learning style is not attractive with relative to the need of science education. According to [23], one of the aims of science education is used to develop students understanding of the method by which knowledge has been gained, appropriate skill has been developed. Practical

work is an essential component of science teaching and learning both for developing students' knowledge about science and developing scientific knowledge.

Regarding to the third research question, table 3 showed that the findings of the study based on the assessments of the availability of science laboratory to help the students learning. As the result vividly indicated that schools found in the study area do not have adequate laboratory to facilitate the teaching process of science subjects and the students do not have the chance to practice hands on activities to engage knowledge about science subjects.

SUMMARY, CONCLUSION, AND RECOMMENDATION

Summary and conclusion

The purpose of this study was to assess the current statues of hands on, minds on and hearts on activities in Woldia Town full cycle primary schools using descriptive survey approach research method. To achieve this purpose, the research questions were:

1. Do students have positive attitude towards science subjects?
2. Do teachers used different methods in teaching science that develop the students' hands on, minds on and hearts on activities?
3. To what extent the schools' laboratory encouraging teaching science subjects?

To answer these research questions descriptive survey research type was used, and the data were collected through questionnaire, observation, and unstructured interview. The data obtained

through these tools were organized and analyzed using quantitative, percentage and mean, and qualitative, narrative, techniques. The analyses revealed the following results:

1. Most of the students were do not have positive attitude towards science subjects
2. The methods of teaching science subject do not exercised hands on, minds on and hearts on activities during science session.
3. Schools in the town have lack of adequate laboratory rooms, chemicals and apparatus in the schools.

Based on the finding the researcher concluded that the method of teaching science subjects in the school found in Woldia Town full cycle primary schools was mainly theoretical. But according to [22], teaching of must include practical activities like hands on activity, to motivate the students' attitude towards science subject and increases their curiosity to develop their scientific knowledge.

Recommendation

Based on the conclusion drawn from the findings, the researcher try to forward the following recommendation: As the mean result indicated, the method of teaching science subject were unsatisfactory, it lacks hands on, minds on and hearts on activity in order to engage students' academic knowledge. So, the school science teachers, school principals, district education office heads should supervise the teaching system and must give remedial action to help students to engage scientific knowledge. Specially, the subject teacher should be dedicative, willing to

include/inculcate/ hands on, minds on and hearts on activity in their day today teaching learning process.

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