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A study on the utilization status of science kits provided by the directorate of secondary education in different schools of Unakoti district, Tripura

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Abstract: *Science kits are innovative kits that are formed exclusively to mix and blend education and fun. These kits not only developed cognitive part of child but also useful for proper development of psychomotor domain of knowledge. We can also say that science kits are the tools used in various aspects of science practical and also beneficial for inducing science learning from classroom lecture method to hands-on-learning method. In school curriculum, science kits are one of the main elements for developing a sense of co-operative work. The science kits developed at upper primary and secondary stages are based on science textbooks developed by NCERT. The kits have been distributed in schools in different parts of the country for making desirable changes in the teaching-learning process. These kits provide scope for various learner centred activities on the concepts of science given at upper primary and secondary stages.*

In the present study the investigators made an attempt to study the status of science kit utilization which is developed and provided by the NCERT for upper primary and secondary school. The major objectives were to study the status of utilization of science kits and problems while using these kits in schools. Descriptive and analytical survey methods were used to study the utilization and problem facing by the teachers while using science kits in schools of Unakoti district, Tripura. The method of selection of the schools did not require any sampling technique. Six schools were randomly selected for the study. Questionnaire, observation and interview techniques were used to gather data for the study. The results revealed that, the absence of science laboratory, scarcity of sufficient skilled science teacher and lack of regular practical classes are leading factors for inadequate and unsatisfactory utilization of science kits during practical class in many schools of Unakoti District. Lack of satisfactory attendance of students and poor quality of science kit, limited funding and time consuming process of replacement of damaged science kits were found to be the important contributing factors associated with the problems faced during science kit utilization in the schools. To overcome these issues science teachers should intensively undergo training on how to use the Science kits. Government should also endeavour to provide the facilities needed for the achievement of proper laboratory infrastructure.

Key Words: *Science Kit, Achievement, Utilization, Skilled Technique.*

1. INTRODUCTION:

Science and technology hold the key to the progress and development of any nation. Every nation of the world needs science for development, independence, sovereignty, self-reliance and growth. This is because science and technology provide the basic tools of industrialization and economic development in the areas of communication, transport, energy, information, pollution and waste control, among others. Science education is foundation for sustainable development as they protect human scientists from ignorance, illiteracy, disease and poverty.

According to Gandhiji (1937), "By education I mean an all round drawing out of the best in child and man body, mind and spirit." From Gandhiji's point of views, learning by doing develops the ideals of co-operative work, inclusiveness, and also develops the society. After birth the individuals learn by doing different activities that also induced by formal education promoted by school. Our school curriculum has different subjects, among them the subject science taught at every level are one of the crucial elements of the school curriculum.

Secondary Education Commission (1952-53) recommended the general science that should be mandatory for all along with its hands on activity i.e., practical work. After that National Curriculum Framework (2005), recommended the use of science kit at upper primary and secondary level. These kits are procured by SSA and distributed to the various government schools.

For exploring science in school, science kits must be on integral part of the science curriculum. These packaged collections of materials for practical or demonstrations in teaching-learning process of physical or biological sciences are now mandatorily available to every school. But in few cases, it also seen that due to various barriers, different schools faced different kind of problems in carry out the utility of science kits or during practical work.

According to Ketudat (1981), Science is to help the student to acquire scientific knowledge which could be applied directly to his daily life and also would show the value of conservation of natural resources and natural habitats and would induce him to observe his own local environment and way of life.

"Teaching scientific skills and cognitive processes related to scientific problem solving and reducing emphasis on the recall of information will remain the curriculum development orthodoxy". –Lewin, 1991-10.

It has been observed that the use of traditional methods of teaching science results in the rote learning and lack of understanding of concepts. If, proper resources are not available, then teachers are bound to choose traditional way of teaching. The important feature of activity based teaching is that it is learner centric. It also allows the learner to study according to his / her own abilities and skills. Studies have shown that activity based teaching is more effective for the development of higher order skills among students. Science educators encourage to replace traditional teacher-centered instructional practices, such as emphasis on textbooks, lectures, scientific facts, with inquiry-oriented approaches that (a) engage students interest in science, (b) provide opportunities for students to use appropriate laboratory techniques to collect evidences, (c) require students to solve problems using logic and evidence, (d) encourage students to conduct further study to develop more elaborate explanations, and (e) emphasize the importance of writing scientific explanations on the basis of evidence.

2. Concept of Science Kit:

Science kits are innovative kits that are formed exclusively to mix and blend education and fun. These kits not only developed cognitive part of child but also useful for proper development of psychomotor domain of knowledge. We can also say that science kits are the tools used in various aspects of science practical and also beneficial for inducing science learning from classroom lecture method to hands-on-learning method. In school curriculum, science kits are one of the main elements for developing a sense of co-operative work.

Science kits are used mainly for two purposes: general and special purpose. General purpose kits are used in elementary schools. On the other hand, special purpose of kits is used in higher level of study. On the basis of science textbook, NCERT develop and provide a set of scientific and general items that are effective for "hands-on-minds-on" learning. It also useful for students to develop skills of handles the equipments. Not only that, it inculcates co-operative work, as well as the mind of experiment on the subject science

The use of science kits has been highly recommended in National Curriculum Framework (NCF), 2005, for effective learning through "hands-on minds-on" learning approaches. Science kit contains quite simple, inexpensive, improvised apparatus which are stored in a small handy box. This box called science kit is simple in shops and is made of wood or iron and is provided with shelves and drawers. It can serve the function of a small movable mini-laboratory. Such kits are found to be very suitable for use in village. Schools which have not facilities exist for science rooms or laboratories than schools can store apparatus and equipment in such kits. So these kits are quite cheap and the items can be easily operated. Students can also use the different equipments. Using this science kit, students can develop skills to handle the equipments

Science kits have been designed and developed by the Division of Educational Kit, NCERT at upper primary and secondary stages. The Kits have the following advantages:

- Availability of necessary pieces of apparatus/ items at one place.
- Multipurpose use of each piece of apparatus.
- Economy of time in setting up of activities/experiments.
- Portability from one place to another.
- Provision for innovation.
- Low cost and use of indigenous resources.
- Environment friendly.

The science kits developed at upper primary and secondary stages are based on science textbooks developed by NCERT. The kits have been distributed in schools in different parts of the country for making desirable changes in the teaching-learning process. These kits provide scope for various learner centered activities on the concepts of science given at upper primary and secondary stages.

3. LITERATURE REVIEW:

Dhimmar, S.J. Patel, R.C. (2021), Conducted a study status of science kit in upper primary schools of Vadodara city. The aims of this study were to investigate the availability, relevance and usability of the science kit. Total 35 schools, 35 teachers and 175 students were taken as representative sample of the whole population. Cluster sampling technique was adopted for selection of science teachers. For selecting the schools simple random sampling was adopted. Questionnaire, Focused group discussion and observation schedule used for collecting the data. The result showed that mostly all schools have science kit. All the science teachers believed that science kit is relevant with respect to the age level of the students. The study also revealed the lacking which did not allow the proper use of science kit by science teachers.

Pareek, R. B. (2019), wrote an article on assessment of availability and utilization of laboratory facilities for teaching science at secondary level in Ajmer, Rajasthan. This study aimed to explore the availability and utilization of a science laboratory for the teaching and learning of science. The study adopted descriptive survey methodology and random sampling. The instruments used for the study were questionnaires for principals, teachers, and students. The study's findings revealed in most participating schools; there were no separate science laboratories, many teachers faced difficulties when conducting science activities due to the large number of students in each class as well as inadequate equipment and materials. The findings also highlighted the absence of assessment of science laboratory practical activities.

Koul, A. and Verma, R.(2018), conducted a study on" Science kits as resource: Issues and challenges". This study highlighted the issues and challenges faced by the Government school teachers of Delhi in India while using science kits during teaching-learning process at upper primary and secondary stages. In this study 40 Government schools of Delhi, India were approached. The result revealed that most of the teachers uses science kits during teaching-learning process but seeks improvement of these kits for proper utilization of these kits particularly for inclusive classrooms.

Das, C. (2018), conducted a study on the availability of chemistry laboratory facilities and it's utilization in the higher secondary schools of Guwahati city, Assam. Objectives of this study were to investigate the availability and adequacy of chemistry laboratory facilities , utilization of the laboratory resources and also to find out the incorporation of safety measures in management of the chemistry laboratories of the Schools. Descriptive survey method was used in this study and selection of the schools did not require any sampling technique. Questionnaire and science laboratory input checklist were used to gather data for the study. Result of the study showed shortage and ineffective use of science laboratories in the high secondary schools.

Arokoyu, A. A. and Charles-Ogan G. I. (2017), studied Availability and Utilization of Laboratory Kits for Practical Teaching of Mathematical Skills in Chemistry, in Nigeria. This study investigated the availability and utilization of laboratory kits for practical teaching of mathematics in chemistry in Ahoada West local government area of Rivers State. A descriptive research design was adopted in carrying out this study. The population of the study was all public senior secondary I (SS1) chemistry students in Ahoada West education zone of Rivers State. A total of two hundred (200) chemistry students were used as a sample for the study which comprises one hundred and twenty (120) male, and eighty (80) female. The data were analyzed using frequency counts and percentages. A structured questionnaire was the instrument used for data collection, and the instrument was face validated by three experts. The result revealed that the availability and utilization of laboratory kits in the sampled senior secondary schools were inadequate.

3. MATERIALS AND METHODS:

Objectives of the Study:

1) To evaluate the status of utilization of science kits in schools of Unakoti district.
2) To study the problems faced by the institutions while using the science kits.

Research Design:

This study was designed as a quantitative research in which a central question states the objectives or the problems of the study. According to quantitative research our study follows a pre-set procedure, reviews of generated data, and

collection and analysis of data to finding out the actual availability and utilization of science kit and problem regarding its using period. It is also a fixed design research.

Population of the Study:

The study was carried out in schools of Unakoti district of Tripura. Among them 3 were H.S, and 3 were secondary school. All the students of grade nine and ten in each school and all teachers teaching science subject for the academic year 2021-22 comprised the population for the present study.

Sample size of the Study:

All the teachers of these population schools teaching science at secondary level were selected according to their presence of particular date when we went to these eight schools and also students of class IX and X present on that day were selected as our sample. Thus the final sample for the present study included 26 science teachers and 243 students.

Method adopted for the Study:

The study is totally based on descriptive and analytic survey method where data were gathered on utilization and problems of science kit.

Tools used for the study:

It consist both close ended and interview type questions for both teachers and students of population schools. The question included 5 point rating scales which were Strongly agree (5), Agree (4), Neutral (3), Disagree (2) and Strongly disagree (1). There were total 18 questions for science teachers out of which 14 were close ended and 4 were interview type. Questionnaire for students consist 8 questions for sample students. All the questions were open ended.

4. DISCUSSION:

Findings of this study suggest that sufficient amount of science kits and science teacher are available in the schools of Unakoti district.

From the findings it is also evident that there is a absence of proper laboratory for utilization of science kit. This finding is in line with that of Hamza and Umaru (2011), who reported the near absence of resources, (human and materials) as well as science laboratory and workshops for the teaching of Basic Science. Also, Nnorom, (2012), Eya and Elechi (2011), Aliyu, (2006),Oriade (2008) and Pareek,(2019), reported on the non-availability of the basic science laboratories in most schools.

Findings of this Study revealed that there is a lack of sufficient skilled science teacher for utilization of science kits which is supported by the findings of Dhimmar & Patel (2021), Nnorom, (2012), Eya and Elechi (2011) and Oriade, (2008) who reported that teachers were not trained on how to use most of the laboratory facilities.

Findings of this study also suggests that majority of students do not get chance to participate actively in practical class while using science kit. This finding supports the study of Beauty, (2008), and Pareek (2019), who concluded that pupils are not given opportunity to handle science kits. The possible reason behind this could be unavailability of regular practical class as well as large number of students in some schools (Pareek, 2019).

Findings also recorded that lack of satisfactory attendance of students, poor quality of science kit, limited funding and time consuming process of replacement of damaged science kit are the responsible factors associated with the problem faced during science kit utilization. This finding is consistent with Barrow`s (1991), Onipede (2004) and Ihuarulam (2008), who in their separate studies reported that science education is faced with the problem of lack of resources with half the schools having no real laboratory talk less of fully equipped ones. Akpan (2006) strongly believed that shortages of laboratory facilities could have serious implications on the quality of schools` output.

From all that has been discussed above, one thing is clear that science kit is available in most of the schools. During the visit of the schools, it was found that most of the schools had science kit but those were in unpacked condition, only in few schools science teachers displayed the equipments properly. This may be due to the unavailability of proper laboratory and due to lack of trained teachers. This finding is also in line with the findings of Dhimmar & Patel,(2021).

5. ANALYSIS:

Analysis of data pertaining to objective-1

Table No. 1: Response of Teachers and Students against different utilization aspect of Science Kits and their mean value.

Particulars	Respondent	Quality Response of Teachers and Students					Mean
		SA(5)	A(4)	N(3)	D(2)	SD(1)	
Science kit Availability	Teacher	9 (34.61%)	14 (53.85%)	3 (11.54%)	0	0	4.23
	Student	96 (39.51%)	93 (38.27%)	39 (16.05%)	8 (3.29%)	7 (2.88%)	4.08
Sufficiency of Science Teachers.	Teacher	7 (26.92%)	13 (50%)	6 (23.08%)	0		4.03
	Student	90 (37.04%)	108 (44.44%)	31 (12.76%)	10 (4.11%)	4 (1.65%)	4.11
Suitable Laboratory	Teacher	0	8 (30.77%)	18 (69.23%)	0	0	3.30
	Student	7 (2.88%)	55 (22.63%)	94 (38.68%)	73 (30.04%)	14 (5.76%)	2.86
Skilled Teachers.	Teacher	1 (3.85%)	11 (42.31%)	14 (53.85%)	0	0	3.5
	Student	7 (2.88%)	38 (15.64%)	90 (37.04%)	87 (35.80%)	21 (8.64%)	2.68
Regularity of Practical Classes	Teacher	10 (38.46%)	13 (50%)	3 (11.54%)	0	0	4.26
	Student	21 (8.64%)	37 (15.23%)	108 (44.44%)	52 (21.40%)	25 (10.29%)	2.90
Problems in utilization.	Teacher	7 (26.92%)	14 (53.85%)	0	5 (19.23%)	0	3.88
	Student	59 (24.28%)	83 (34.16%)	52 (21.40%)	39 (16.05%)	18 (7.41%)	3.61
Active participation of student.	Teacher	5 (19.23%)	16 (61.54%)	5 (19.23%)	0	0	4
	Student	21 (8.64%)	104 (42.80%)	79 (32.51%)	24 (9.88%)	15 (6.17%)	2.82

Interpretation:

According to the above table the responses given by the respondents about the utilization of Science Kits. The different utilization aspects were tabulated in table 1. The parameters are Science Kit availability, Sufficiency of Science Teachers, Suitable Laboratory, Skilled Teachers, Regularity of Practical Classes, Problems in Utilization, and Active Participation of student.

It is found that 53.85% and 34.61% were agreed and strongly agreed respectively to the sufficient availability of science kits in schools while 39.51% and 38.27% of students were found to be strongly agreed and agreed respectively and only 2.88% were strongly disagreed to the availability of science kit.

In case of sufficiency of science teachers in school it is found that 50% and 26.92% teacher were agreed and strongly agreed respectively while 44.44% and 37.04% student were agreed and strongly agreed respectively and only 1.65% student were strongly disagreed regarding the fact of sufficiency of science teachers in school.

Regarding the status of suitable laboratory, only 30.77% teacher responded to agree and 69.23% remained neutral whereas, 22.63% student responded to agree and 38.68% remained neutral.

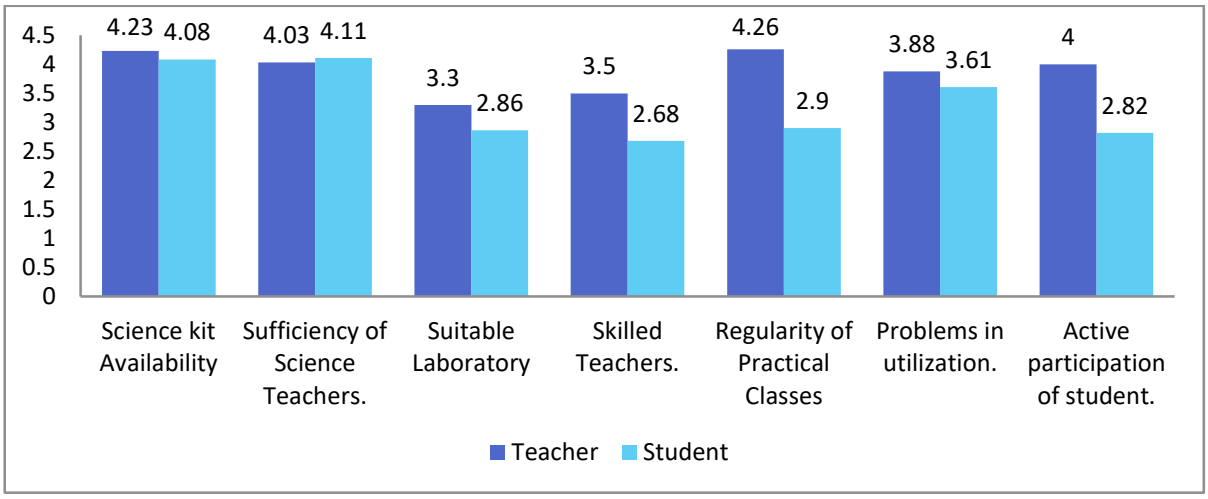
42.31% and 3.85% teacher were agreed and strongly agreed to sufficiency of skilled teacher in school while 53.85% teacher remained neutral. 35.80% students were disagreed and 37.04% remained neutral regarding the fact of sufficiency of skilled teacher.

In case of regularity of practical classes, 50% and 38.46% teacher responded agree and strongly agree while only 11.54% remained neutral. On the other hand, 44.44% students remained neutral about the regularity of practical classes and only 15.23% found to be agreed.

It is also found that 53.85% and 26.28% teacher were found to be agreed and strongly agreed respectively in response to problems in utilization of science kits. While 34.16% and 24.28% student were agreed and strongly agreed respectively on this issue.

According to the table it was also evident that 61.54% and 19.23% teacher found to be agreed and strongly agreed respectively on active participation of student. Whereas, 42.80% students were agreed on this statement and 32.51% remained neutral.

Figure 1: Graph showing mean difference of response of teacher and students



Interpretation:

The data obtained from responses by students and teacher for quality items under utilization of science kit in schools. For science kit availability the obtained mean for teachers and students were 4.23 and 4.08 respectively. This shows that the students are less aware of availability of science kit in comparison to teachers.

The mean score for Sufficiency of Science Teachers by teachers and students were 4.03 and 4.11 respectively. This reveals that sufficiency of science teacher is not up to the mark.

The mean score for suitable laboratory by teachers and students were 3.3 and 2.86. And this result shows that there is a lack of science laboratory in the schools in view of students.

The mean score for regularity of practical classes of teachers and students were 4.26 and 2.9 respectively. This reveals that there is a contradiction between responses of teachers and students regarding the regularity of classes. This implies there is a lack of regular practical classes in schools.

The mean score for problems in utilization of teachers and students were 3.88 and 3.61 respectively. The result shows that teacher and students to or some extent of problem while utilizing the science kits.

The data obtained for active participation domain from teachers and students were 4 and 2.82 respectively. This shows that there is a contradiction between response of teacher and students, which indicate there is a less active participation of students in practical classes.

Analysis of data pertaining to objective-2

Table No. 2: Response of Teachers in terms of different problems faced during science kits utilization

SL. No	Particulars	Quality Response of Teachers				
		SA(5)	A(4)	N(3)	D(2)	SD(1)
1.	Satisfactory Attendance	0	5 (19.23%)	7 (26.92%)	14 (53.85%)	0
2.	Quality Science kits	0	4 (15.38%)	13 (50%)	7 (26.92%)	2 (7.69%)
3.	Replacement of Damaged Science Kits	1 (3.85%)	5 (19.23%)	9 (34.61%)	11 (42.31%)	0

4.	**Limited Funding**	8 (30.77%)	12 (46.15%)	0	4 (15.38%)	2 (7.69%)

Interpretation:

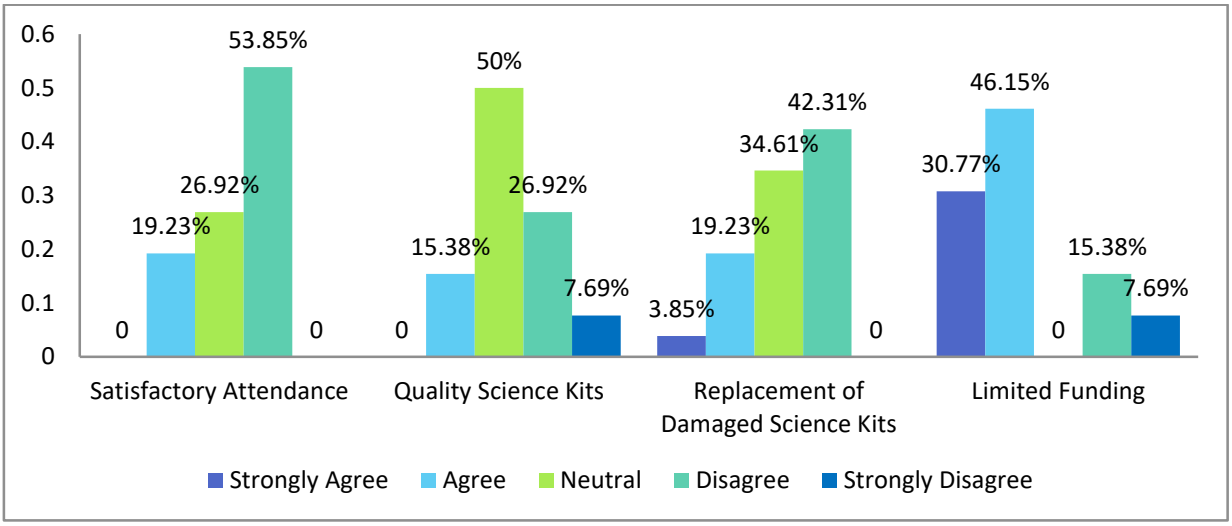
The above table shows the different problems faced by the teachers during conduction of practical class. The data obtained from domain satisfactory attendance reveals that 53.85% teachers disagreed to the fact that there is satisfactory attendance of students in practical classes whereas only 19.23% teachers were agreed and 26.92% remained neutral.

In case of quality of science kits, 26.92% of teachers found to be disagreed and 50% remained neutral on the quality of science kits.

Regarding the concern of replacement of damaged science kits, it is found that 42.31% teachers were disagreed, 34.61% remained neutral and only 19.23% were agreed.

46.15% and 30.77% teachers were agreed and strongly agreed respectively in the matter of limited funding for regular conduction of science practical class whereas 15.38% and 7.69% teachers disagreed and strongly disagreed in this matter.

Figure 2: Graph showing the percentage of response of teachers in terms of different problems faced during science kits utilization



6. FINDINGS:

Results presented above in Tables indicated the following:

1. From the study it is found that, there is availability of science kit in the studied schools of Unakoti District.
2. Sufficient no. of science teacher is present in the schools of Unakoti District.
3. Majority of the teacher and students responded neutral in response to status of suitable laboratory which indicates the absence of proper laboratory for utilization of science kit.
4. This Study revealed that there is scarcity of sufficient skilled science teacher for utilization of science kits.
5. There is a lack of regular practical classes in the schools.
6. It was found that teacher and students to or some extent face problem while utilizing the science kits.
7. Majority of teachers responded that there is active participation of students during practical class with science kit. But response from students revealed that majority of students do not get chance to participate actively in practical class while using science kit.
8. Lack of satisfactory attendance of students and poor quality of science kit are the prime responsible factors associated with the problem faced during science kit utilization.
9. Limited funding and time consuming process of replacement of damaged science kit are also important contributing factors associated with the problem faced during science kit utilization.

7. RECOMMENDATIONS:

1. This study provides the opportunity to find out the actual scenario of science practical or the use of science kits in the schools at secondary level of Unakoti district of Tripura.
2. How properly science kits are utilized in that particular district is also become crystal clear through this study.
3. This study also have great significance as it paves the way of further investigation of science field in that area.
4. Through this study current problems related to doing science practical at secondary level also comes in the light of consciousness.
5. This study enables the further development and modification of science laboratory sector at secondary level of Unakoti district.

8. CONCLUSION:

The main purpose of this research study was to know whether science kits are utilized by teachers during teaching-learning process. The study also helped in identifying the difficulties faced by teachers during transaction of the practical class with the help of kit items. It was found that absence of science laboratory, scarcity of sufficient skilled science teacher and lack of regular practical classes are leading factors for inadequate and unsatisfactory utilization of science kits during practical class in many schools of Unakoti District. Lack of satisfactory attendance of students and poor quality of science kit, limited funding and time consuming process of replacement of damaged science kits were found to be the important contributing factors associated with the problems faced during science kit utilization in the schools.

Regular teaching-learning process accompanied with practical work using sufficient kits is always beneficial for the students leading to better academic achievement. Researches show that there is a significant strong relationship among facility availability, adequacy and utilization and student's academic achievement. Effective science teaching-learning process with proper utilization of science kit help to develop creativity, power of observation, critical thinking skills, to equip students with attributes of scientific enquiry, and mastery of manipulative skills, resourcefulness and mechanical comprehension and to achieve the development goals.

Science teachers should intensively undergo training on how to use the Science kits. Government should also endeavor to provide the facilities needed for the achievement of proper laboratory infrastructure. With that, the nation will advance effectively in the area of science and technology and thereby improve the quality of life.

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