

RESEARCH ARTICLE

Availability and use of Audio-Visual Aids in Teaching Science

Sandeep Dawadi^{1*}

¹Physics Education Department of Science Education Mahendra Ratna Campus, Tahachal, Kathamandu, Nepal

Corresponding Author: Sandeep Dawadi, Sandeepdawadi515@gmail.com

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Abstract

Audio-visual instructional materials are highly motivating supplements to make the teaching effective. The learning process itself is based primarily on sensory experiences. So, availability and use of audio, visual aids helps to make the science learning permanent, to transfer the learning and to understand the science structure. The main objective of the study is to find out the availability of instructional materials in the secondary private and public schools, to find out the teacher knowledge and skills to construct and use of teaching materials. The study is based on primary data drawn by observation and questionnaire on the field visited and secondary sources of data collected from the checklist and Districts Education office, Kathmandu. The data analysis procedure was descriptive in nature and appropriate statistical measurements with a sensible description of availability and use of instructional materials in teaching science. Thus, this study proved the availability and use of instructional materials more than private school with compare to public schools and the availability of instructional materials in the schools was not satisfactory. Even available materials in the schools were not used properly by teachers at the time of teaching in science. The findings and conclusion of the study will help to concern agencies. It is better to conduct such type of research studies at the national level.

Keywords: Audio-Visual; Availability; Instructional material; effectiveness; learning

Introduction

Different education plans had been recommended and emphasized for the science curriculum at school level in Nepal. Science education has been provided indispensable to human being even to a layman. Introduction of science at school and higher level is not easy task in imparting meaningful science knowledge. Here comes a need of making science meaningful and significant. So, now a day's it is emphasized on inductive and analytical method to make science teaching more meaningful and practical. Meaningful and practical in science teaching refers to the visualization and intuition or the visualization touches the feeling of the learner. Hence, visual aids (instructional materials) play an important role in making science teaching meaningful and significant. It helps to understand what, how and why the science study is required. Researcher is not yet sure that any study in this field has under taken. Thus, the need of the study has been felt most urgent. To realize the benefits of audio visual aids in teaching, secondary schools need to adopt effective methods for using and managing their audio, visual resources. Educators, administrators and policy planners worldwide have made many futile attempts in improving education through the integration of audio visual aids in classroom teaching/learning process. Hence, this study was focused on the utilization of audio visual aids and facilities or availability at Secondary School level in Nepal.

Students of school level think in terms of concrete materials. So the effectiveness of the science teaching depends upon the availability and use of audio visual teaching materials in the classroom (Gautam,2000). The learning process itself is based primary or secondary experiences. The audio visual aids provide the students auditory and visual experiences, which promote the learning. Besides this with the help of the teaching aids, the teacher will also be able to arouse the interests in the mind of student and be able to motivate them to the learning process. Thus it is clear that the teaching materials are highly motivating supplements to make the teaching effective.

Statement of Problem

The problems of the statement are study on the availability and use of audio visual aids in teaching science. i.e, what is the situation of the use of audio visual aids in secondary school level of private and public school? Are there adequate teaching materials to teach science at the secondary level? Are the teacher aware and cognizant of the appropriate creation and use of teaching material in teaching science at secondary level? Is there a difference between private and public schools in the use of audio-visual aids in teaching science?.Curriculum and textbooks were revised and written from time to time. New approaches to classroom teaching were discussed and an

ample use of appropriate teaching aids and models were recommended for the secondary level. In order to achieve the objectives of science teaching as declared in the new education plan, there must be at least a moderate supply of audio visual teaching materials in all schools and the teacher must be well qualified and cognizant in using these materials. Most of the schools of Nepal are still using the traditional method characterized by mastery of subject matter through drill, repetition and memorization. This method is subject centered, teacher-dominated and in this method is subject matter is presented with limited teaching aids. In this context, knowledge and awareness of the use of audio-visual aids is essential for every concerned person and agency. Hence, this study is new in its kind and focused on to find out the use and availability of audio, visual aids in teaching science in the secondary private and public schools.

Research Questions

This study is geared to find out the answer to following questions:

- Are there adequate teaching materials available to teach science at the secondary level?
- Are the teacher aware and cognizant for appropriate creation and use of teaching material in teaching science at secondary level?
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Population of the Study

All the science teachers of the secondary level including secondary school at Kathmandu district constituted the population of the study. According to the Districts Education Office (DEO), there are 948 schools which are providing secondary education. Out of them 159 schools is exclusively S₁-type whereas 784 schools are S₂-type.

Data Collection Tools

Table 1. Availability of the Physics instructional materials

S.N	Name of materials	S ₁ -School				S ₂ -School				Total			
		AV	%	N	%	AV	%	N	%	AV	%	N	%
1.	Meter Scale	5	100			5	100			10	100		
2.	Spring Balance	5	100			5	100			10	100		
3.	Measuring Cylinder	5	100			5	100			10	100		
4.	Electrical instrument												
	Ammeter	4	80	1	20	3	60	1	20	7	70	2	20
	Voltmeter	2	40	2	40	3	60			6	60	2	20
	Bulb	3	60			5	100			8	80		
	Dry cells	3	60			5	100			8	80		
5.	Optical instrument												
	Plain mirror	3	60			4	80			7	70		

Observation check list, questionnaire and class observation was used as data collection tools. The researcher was also study the syllabus, text books, teacher guides, curriculum of class nine and ten as well as other sources on the basis of which list of instructional materials can be made.

Data Collection Procedures

For the data collection, the researcher personally visited each of the schools included in the sample and also observed the classroom. The questionnaire were filled by interviewing the senior science teachers of the schools

Data Analysis Process

The questionnaire contained introductory information, which explained the responded to fill the form freely and sincerely. A tally sheet was used to organize the obtained data. The data analysis procedure was descriptive in nature and appropriate statistical measurements with a sensible description of availability and use of materials in teaching of science at secondary level.

Availability of the Materials in School

Following tables shows the list of frequently used materials in the instruction of the science lessons and the extent of their availabilities in the schools. The table also shows absolute as well as the percentage description of the extent of availability of materials.

Physics deal with the study of physical phenomena (i.e. measurement, light, heat, electricity and magnetism etc.). For the study of physical phenomena in school level the availability of physics instructional material should adopts. Availability of the physics instructional materials in S₁ - schools and S₂- schools are categories in the following table 1.

	Glass slab	2	40	5	100	7	70
	Lens	5	100	4	80	9	90
6.	Magnet	5	100	5	100	10	100

The statistics shows that materials such as meter scale, spring balance, measuring cylinder, magnet was available in 100% of both public as well as private school. Among the material that lies in electric category, ammeter was available 80% in public school and 60% in private school. So, it can be said that one more private school lacks ammeter than public school. In the same category of electrical instrument voltmeter was available in 40% of public school and 60% in private school. Likewise, 60% public schools had electric bulb while other 40% lacks and 100% private school had electric bulb. In the same category, Dry Cell was available in 60% in Public School it lacks in 40% in public school while 100% private school had Dry Cell. Moreover, one for ammeter in public school, one for private school and two for voltmeter on public Availability of the chemistry instructional materials in S₁-schools and S₂- schools are presented in given Table 2

school didn't had any response. In the next grouping of Optical Instrument, Plane Mirror was deficient in 60% public school and was not available in 40% public school while 80% private school owns it and 20% didn't own it. Among the optical instrument glass slab was available in 40% public school while 60% of them lacked it and in private school, 100% of them possess glass slab. Lens was another optical instrument which is possessed by 100% of public school and 80% of private school while one private school was deficient in it. Moreover, for this category none of the school had any response for any material. Chemistry deals with the study of chemicals. To gives the basics concept of chemicals for school level, availability of the chemistry instructional materials is the most.

Table 2 Availability of the Chemistry Instructional Materials

S. N	Name of materials	S ₁ -School				S ₂ -School				Total			
		AV	%	N R	%	AV	%	NR	%	AV	%	N R	%
7.	Chemistry practical apparatus												
	Beakers	5	100			5	100			10	100		
	Test tube	4	80			5	100			9	90		
	Conical flask	1	20	1	20	4	80			5	50	1	10
	Wolfe's bottle	1	20			4	80			5	50		
	Delivery tube	1	20			4	80			5	50		
	Thistle funnel	1	20	2	40	4	80			5	50	2	20
	Gas jar	1	20			4	80			5	50		
	Trough	2	40	3	60	4	80	1	20	6	60	4	40
	Beehive Shelf	1	20			4	80			5	50		
	Round bottomed flask	1	20	2	40	4	80	1	20	5	50	3	30
	Hard glass test tube	2	40			5	100			7	70		
8.	Chemicals												
	Copper sulphate	1	20			4	80			5	50		
	Table salt	5	100			5	100			10	100		
	Ether	1	20	2	40	3	60	1	20	4	40	3	30
	Universal indicator	3	60			4	80			7	70		
	Baking soda	1	20	2	40	4	80			5	50	2	20
	HCL,H ₂ SO ₄ ,HNO ₃	2	40			4	80			6	60		

In the same way in next category of Chemistry, Beakers were possessed by 100% of both Public and Private School. Test Tube was available in 80% public school and not available in 20% public school while 100% private school had Test tube. Delivery tube, Thistle funnel, Gas jar,

conical flask, and Wolfe's bottle were available in 20% public school and 80% of private school. In 40% public school Trough was available where as 80% of private school had Trough. Beehive Shelf as well as Round Bottomed Flask was Possessed by 20% public school and

40% lacked it while 80% of private school had Beehive Shelf and Round Bottomed flask. Eventually, hard glass test tube was available in 40% public school and not available in 60% public school while 100% private school had possession of hard glass test tube. In the grouping of chemical substance, in 20% public school Copper Sulphate, Ether and Baking soda were available. In private school Copper Sulphate was available in 80%, Ether was available in 60% and Baking Soda was available in 80%

school. Table Salt was available in all of the public and private school. And Universal indicator was available in 60% public school and 80% private school. And HCl, H₂SO₄, HNO₃, were available in 40% public school and 80% private school. Two for ether in Public School, One in Private school, two for baking soda in public school didn't have any response.

Availability of the biology instructional materials of S₁ - schools and S₂- schools are presented in the table 3.

Table 3. Availability of the Biology instructional materials

S.N.	Name of materials	S ₁ -School				S ₂ -School				Total			
		AV	%	NR	%	AV	%	NR	%	AV	%	NR	%
9.	Microscope	5	100			4	80			9	90		
10.	Specimen	3	60			4	80	1	20	7	70	1	10
11.	Permanent slide	4	80			4	80			8	80		

Table no-6 shows the Microscope was available in all public schools while 20% private school lacked it and Specimen and Permanent slide were possessed by 80% private school while Specimen was possessed by 60% public school and Permanent slide was possessed by 80% of public school. In average, out of 31 materials only 55.54% were available in public school. Similarly, out of 31 materials 85.16% were available in private school. Integrated result, only 70.97% materials were available out

of 31 materials. So, the statistics demonstrated that private school have more materials available than public School. During the study period of Audio Visual Aids it was found that among ten schools including private as well as public school, in public school there were less material in comparison to private school.

There were other 8 major materials surveyed by researcher. The materials and their availability are shown below in table

Table 4 Availability of Reading Materials

School	Name of material	Total no.of school	Available	%	Not available	%
PUBLIC	Text books	5	5	100		
	White board, marker, duster	5	5	100		
	Curriculum	5	5	100		
	Teacher's guide	5	5	100		
	Reference books	5	3	60	2	40
	Computer	5	2	40	3	60
	Internet	5	2	40	3	60
	Bulletin Board	5	3	60	2	40
PRIVATE	Text books	5	5	100		
	White board, marker, duster	5	5	100		
	Curriculum	5	4	80	1	20
	Teacher's guide	5	5	100		
	Reference books	5	5	100		
	Computer	5	5	100		
	Internet	5	4	80	1	20
	Bulletin Board	5	5	100		

Table 4 shows the list of frequently used materials in the instruction of science and the extent of their availabilities

in the schools in the sample. Table 7 shows that all school i.e. 100% public school were focused to have materials

such as text books, white boards, marker, duster, curriculum and teacher guide. But references books and bulletin Board are only available in three schools; computer and internet are only available in two schools. Table 4 also shows that all school i.e. 100% private school were focused to have materials such as text books, white board, marker, duster, teacher guide, reference books, computer and bulletin board. But curriculum and internet were not available in one private school.

Utilization of Teaching Materials in Science Class

Beside the availability and non-availability of material, the study also propounded to explore whether

the teachers were enthusiastic and cognizant about the construction and use of materials. Above table explains about the availability and non availability of whole materials necessary in science classes. But the condition of materials (i.e. whether they were used or not) are unknown. So, the researcher perform next more action to know about it.

As the researcher cannot get all information only from interview and checklist. To fulfill the gap the researcher observed at least three science classes of each teacher regularly. And the information that the researcher collected about the condition of utilization of materials in their science classes are shown in the given table 5

Table 5 Utilization of Teaching Materials in Science Class

Type of school	S.N.	Name of materials	Available Use			Not Available Would Use						
			Yes	No	Reason for not using			Yes	No	Reason for not using		
					N.K	M.T	N.E			N.K	M.T	N.E
PUBLIC	1.	Chart paper	1	4	2	2						
	2.	Computer	1	1	1			2	1	1		
	3.	Internet	1	1	1			2	1	1		
	4.	Model	2	3		2	1					
	5.	Real Material	3	2	1	1						
	6.	Smart board	1					2	2	2		
	7.	Lab Material	2	3		2	1					
	8.	Tape Recorder	1	3		1	2	1				
PRIVATE	1.	Chart paper	4	1			1					
	2.	Computer	5									
	3.	Internet	4					1				
	4.	Model	4	1			1					
	5.	Real Material	2	3	1	1	1					
	6.	Smart board	1					2	2	2		
	7.	Lab Material	4					1				
	8.	Tape Recorder	5									

Further description of used materials (i.e. Chart paper, computer, internet, models, real materials, smart board, lab materials and tape recorder) in science classes during the observation are as flows. As in evident from the table, chart paper is available school. Four teacher didn't use chart paper due to the no knowledge and taking much time. One teacher of private school didn't use chart paper due to its less effectiveness. Concisely, every school have chart paper but it was not used by many schools due to some of its stumbling block.

Computer

Computer is very essential material for teaching/learning purpose. It is very effective and can be used for making

student to understand the subject topic matters. But it was not used more in public school. Computer was available in two public school and all of five private schools have computer. Out of two public school having computer, one school use it but next school didn't use it because of no knowledge of applications. In three schools computer were not available and in two schools out of them it was said that they would use it if it was available. But next school wouldn't use it though if it was available due to lack of knowledge of application. In brief, it could be said that there was very poor use of computer in public schools compare to private schools.

Internet

Internet is another materials where almost all resources are available for teaching and learning purpose. But its use was also seemed to be poor in schools. In two public schools, internet was available but only one public school use it. Another school didn't use it due to lack of skilled human resource. In private school, three private school have provision of internet and they use also. If available, two public school would use internet but one public school wouldn't use it due to lack of knowledge of application. And the three private school where there was no provision of internet however they would use it if it is available. In short, it was recognized that internet was used more by private school than public school.

Models

Models are mock-up material which helps students and teacher for teaching and learning process. It was available in all five public school but only two public school use it and three public school didn't use it. Two public school didn't use it because it consume much time and one public school didn't use it because it was not effective. Among five private school, four private school use it but one private school didn't use it because it was not too effective. In short it can be said that private school were using model then public school which weren't using it though it was available in all public school.

Real materials

Real materials are very important and frequently used material in schools science classes. It gives long term concepts of science subject. The teacher expressed that real materials were useful as well as effective. Real materials are available in local area which gives exact concept to student and it helps to teacher by making the topic easy for teaching and teacher also can give real concepts about science classes. The above table shows that three teachers of public school were using real materials in the time of observation, but two teachers of public school didn't use any real materials in their classes due to the lack of knowledge and lack of time. But in the case of private school, two teachers use real materials in their lesson, but three teachers didn't use real materials due to the lack of knowledge, time and one teacher said that these materials were not effective.

Smart board

Smart board is the materials that contain different materials for many subjects. It is the most important audio/visual instructional materials which can store the previous courses too. So it can help teachers to teach and students to remember. Among both private and public school only one public school and one private school had smart board. But other school didn't have smart board. The school where

smart board was available, teacher use it. Out of not available other four public school, teacher of two public school would use smart board but other teacher of two public school wouldn't use it due to the lack of knowledge in application, though it would be available. And among the teachers of not available other four private school also, two teacher would use, if it was available but next two wouldn't use it due to the lack of knowledge of application.

At last it could be said that, there was no actual difference in the utilization of smart board between private and public school.

Lab materials

Lab materials is very useful materials for the visual and experimental teaching and learning process. The general lab materials were available in all type of schools but not sufficient for science teaching. The general lab materials were available in all public school but only two of them use it and three didn't use it. Two public school didn't use it because it was much time consuming and one public school didn't use it because it was not too much effective. While in private school it was available in four school and was also used by all four private school. The private school which didn't have lab material would use it if it was available. Like this we can say in short that lab materials are neglected to use in many public school while private school use it in required time.

Tape recorder

Tape recorder is also a useful material in audio based science classes. It makes the topic courses interesting for the student so that they can easily understand the theme of course. Tape recorder was available in four public school and only one public school use it. But three school didn't use it because one public school think that it was much time consuming, while other two public school said that it was not effective. Then, in private school Tape recorder was available in all school and it was also used by all private school. In short it can be said, private school were properly using the tape recorder than public school which were not using it although it was available.

Conclusion

The availability of the instructional materials in the teaching materials were essential for teaching concepts of Science meaningfully. Most of the teachers were able to use these visual aids in teaching Science. Though only some materials were made by teachers themselves, most of the materials couldn't be made either because of lack of time or lack of materials. That's why most of the materials were bought from the market. Materials like Textbooks, White boards, Marker, Dusters, Curriculums, Teacher's guide books and other basic related materials were available in all types of school but materials like Reference books, internet, computer and Bulletin board

were not available in public schools. Similarly, curriculum and internet were not available in some private schools. Private schools have more instructional materials and used more materials than public schools.

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