



Students' Motivation towards Science Learning (SMTSL) - An Intervention with Video and Quizzes

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Authors' contributions

This work was carried out in collaboration among all authors. Authors BS, RNR and SSD designed the study and wrote the protocol. Author BS performed the statistical analysis, wrote the first draft of the manuscript and managed the literature searches. Authors RNR and SSD managed the analyses of the study. All authors read and approved the final manuscript.

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ABSTRACT

Science, as a subject is universal and knows no boundaries. The claims of Science for inclusion in the school curriculum came to be recognized after years of active and persistent efforts. Many students find science extremely inspiring and interesting, however when amply motivated. Pre-test and post-test experimental research design, was adopted for the study. A sample of 219, 8th class students (169 female, 50 male students) from six Ashram high schools of Warangal district was selected. Students' Motivation Towards Science Learning (SMTSL) (Tuan et al. [1]) scale was adopted in this study. The sum of SMTSL hiked to 87.38% from 73.28% in post-test. This increase was attributed to the intervention through tutoring students with video lessons and evaluating with quizzes before and after screening video lessons. The variable Performance goal, contributed to the maximum (33.62%). A shift in students from moderately motivated category to highly motivated category was also found in post intervention situation.

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1. INTRODUCTION

Science is a sum of knowledge of natural systems as well as a process of establishing, extending, refining and revising of that knowledge for application in day to day life. Hence, in learning science one should understand it as knowledge and process. The eventual goal of science education is to produce individuals capable of understanding and evaluating information which is scientific in nature. This enhances the ability of making decisions appropriately incorporating information, there by produce scientists, engineers, and other science-based professionals with sufficient as well as diversified skills.

It is widely accepted that student motivation is a key element within the learning process. More so, science learning calls for active participation of students in the class [2]. The student has to be provided with both intrinsic and extrinsic motivation. Intrinsic motivation is the stimuli within the individual, while extrinsic is from outside the world. A student who is intrinsically motivated undertakes an activity for its own sake, for the enjoyment it provides, the learning it permits, or the feelings of accomplishment it evokes. An extrinsically motivated student performs in order to obtain some reward or avoid some punishment external to the activity itself, such as grades, stickers, or teacher approval. Both the outcomes are essential for successful school education.

UNESCO [3], in the context of international expert group meeting on science and mathematics education policies, stated that all schools and schooling systems accept part of their role as preparing children for the world of work, sometimes implicitly and, more and more, explicitly. Thus, the school systems and their stakeholders will see that affective and motivational aspects of science learning are important not only in the classroom, but also in the wider societies.

Turner & Patrick [4] opined that students must be interested and motivated to learn before the actual learning takes place. Doing that successfully is leading to motivation to learn more. If learners are engaged in classroom activities on a cognitive level, they acquire the conceptual understandings expected of them. Hence, engaging the student in learning by

means of an effective technique is the key for motivation.

Video can be an effective education tool for teaching as well as learning science. Satyaprakasha and Behera [5] revealed that multimedia teaching significantly enhanced the achievement with respect to knowledge, understanding and application and total achievement in biology as compared to conventional method.

Quiz is referred as teaching, learning and quick assessment tool. Many researchers consider quiz as mind sport, as it provides feedback on strengths and weaknesses of the quiz taker. In many instances quizzing is used as yardstick for measuring the competitiveness of the individuals, by limiting them to time and content frame. It stimulates student to look beyond their textual knowledge and establish relationship between theory and application of the learnt concepts.

Kayser [6] revealed that frequent quizzes were increased the student retention. Quizzes promote positive impact upon student retention and mastery of material. Gholami and Moghaddam [7] indicated that the group with weekly quizzes performed better than the group without quizzes.

The main aim of the study is to assess the impact of videos and quiz on students' motivation towards science learning.

2. METHODOLOGY

The present study, "Students' motivation towards science learning (SMTSL) of 8th class students" was conducted in six Ashram high Schools of Warangal district. Pre-test and post-test experimental research design, was adopted for the study.

2.1 Sample

A sample of 219 students studying 8th class (169 female, 50 male students) from six Ashram high schools of Warangal district was selected out of which, three were girls schools located in J Pet, Tadvai and AK Ghanpur and three were boys schools in R Gudem, Kalwapally and CB Pally, due to gender segregated admissions.

2.2 Instruments

The motivation possessed by the 8th class students in six Ashram Schools was measured

by means of adopting the scale developed by Tuan et al. [1]. This was translated into local (Telugu) language. This questionnaire consisted of six scales viz., I. Self-efficacy, II. Active learning strategy III. Science learning value IV. Performance goal V. Achievement goal and VI. Learning environment stimulation. Each variable has a scale with exclusive and relevant statements to measure respective variable.

2.2.1 Self-efficacy

Self-efficacy was defined as the belief of students in their own ability to perform well in science learning tasks.

2.2.2 Active learning strategies

The active role taken in using a variety of strategies to construct new knowledge based on their previous understanding by students.

2.2.3 Science learning value

The value of science learning is to let students acquire problem-solving competency, experience the inquiry activity, stimulate their own thinking, and find the relevance of science with daily life.

2.2.4 Performance goal

The performance goal is the spirit of student's in science learning to compete with other students and get attention from the teacher.

2.2.5 Achievement goal

Achievement goal is the feel of satisfaction of students as they increase their competence and achievement during science learning.

2.2.6 Learning environment stimulation

Learning environment included the surroundings of students such as curriculum, teachers' teaching, and pupil interaction that influenced students' motivation in science learning.

The inventory consisted of 35 items on five point continuum- strongly agreed, agreed, no opinion, disagreed and strongly disagreed with 5,4,3,2 and 1 respectively for positive statements and 1,2,3,4 and 5 for negative statements. Questionnaire was executed before and after intervention, to find the significance of intervention in Physical science and Biology learning.

2.3 Video Lessons and Quiz

Three lessons each from Physical Science and Biology were chosen and developed 10 video lessons in local language (Telugu) with an average duration of 11 minutes and found their reliability as 0.86. Six quizzes were also prepared and finalized duly following the validation process, with ten multiple choice items each with a weightage of 0.5 marks.

2.4 Data Analysis

The research data is analyzed with the help of SPSS 15.0 package programme.

3. RESULTS AND DISCUSSION

3.1 Gender

Gender was operationally defined as the biological sex of the sample as female or male. The following Table 1 shows the gender profile of the purposively selected 8th class students of six Ashram High Schools.

Table 1 shows that more than 3/4th sample were female (77.17%) students. As admission system is segregated, either of the gender was found in schools. Tribal Ashram Schools located in J Pet, Tadvai and AK Ghanpur were Girls schools and remaining three were boys schools. Highest number of girl students (81) was found in Tadvai while boy students were more in CB Pally (25) compared to other two schools. It was informed by the teachers, that the dropout rate of girls was lower than boys, which might be the reason for less boys' strength. This could be attributed as one of the outcomes of the developmental programmes, focusing the girl child education.

3.2 Age

Age was the number of years completed by the respondents at the time of investigation. The age of students studying 8th class in Ashram Schools ranged between 11 and 16 years.

The lower was 11, while upper was 16 years. However, more students were between 11-13 years (52.51%) compared to 14-16 years (47.49%). More girl students (47.49%) between 11-13 years, than boy students (5.02%) were evident from the data. Similar was the trend in case of 14-16 years interval also, i.e., more girl students (29.68%) than boy students (17.81%). No exclusive reasons were found for studying 8th class even at the age of 16 years, except

delayed admission into school. The mean age was found to be 13.5 years, which is more or less equal to age norms of formal education system in general.

Satyaprakasha and Behera [5], in their study on effectiveness of multimedia teaching on achievement of 8th Standard students found 8th class students with a mean age of 13 years.

3.3 SMTSL Intervention

The motivation possessed by the 8th class students in six Ashram Schools was measured by means of adopting the scale developed by Tuan et al. [1].

The questionnaire was executed before and after the intervention programme i.e tutoring students with video lessons and evaluating with quizzes. These video lessons were developed and subjected to content analysis.

The following Table 3 presents variable wise mean scores of pre test results.

The Table 3 depicted the mean score on each item of SMTSL attained by the students of each school. The maximum score one can attain would be 175. The SMTSL in all schools was above 70%, and more or less showing uniform trend between schools and also between girls and boys. An overall of 73.28% SMTSL environment was evident from the data and contribution of self-efficacy was 12.86%, active learning strategy 18.57%, 11.75% by science learning value, only 4.16 in case of performance goal achievement, 12.01% through achievement goal orientation and learning environment up to 13.93%.

After execution of the SMTSL questionnaire, video lessons of physical science and biology were screened to students and evaluated with quizzes.

Table 4 clearly indicated that an increase in post quiz scores in both the subjects was evident from the data. The % increase was high in Biology than Physical science, which was vice versa in pre quizzing situation. Video lessons might have created stimulating learning environment to interact with Biology content while answering the quiz questions.

Ominowa et al. [8] examined the use of Video Mediated Instruction (VMI) and Classroom Demonstration Technique (CDT) to enhance the understanding of chemistry concepts, acquisition of skills, retention ability and improve the performance of the students in the subject. The instructional media was highly interactive and effective. The results showed that there was a significant difference in the performance of students in the VMI and CDT. Students taught with VMI performed significantly better than those taught with CDT.

Gholami and Moghaddam [7] indicated that the weekly quizzes performed better than the group without quizzes. MaDaniel et al. [9] reported quizzing as effective technique to assist mastery and retention of the content. Roediger et al. [10] stated quizzes boost academic performance. Cooper et al. [11] stated that the assignments and quizzes were helpful in understanding of the subject material. The results of the present study were also as per with them.

3.4 Impact of Videos and Quiz on SMTSL

In the present study, video lessons and quizzes were selected with a dual purposed of serving as content input teaching tools and motivation tools as they both engage students in learning. After the intervention, i.e screening of all six video and corresponding quizzes, the SMTSL questionnaire was executed once again to measure the motivation for learning. The data was computed and presented in Table 5.

Table 1. Gender profile of 8th class students of Ashram Schools

n1= 38, n2=15, n3=81, n4=10, n5=50, n6=25			
Gender	Female	Male	Total
J Pet	38	--	38
R Gudem	--	15	15
Tadvai	81	--	81
Kalwapally	--	10	10
AK Ghanpur	50	--	50
CB Pally	--	25	25
Total	169(77.17)	50(22.83)	219(100.00)

N1: J Pet, N2: R Gudem, N3: Tadvai, N4: Kalwapally, N5: AK Ghanpur, N6: CB Pally

Out of 175, the maximum score of SMTSL, irrespective of gender all the schools attained more than 85%. The sum of SMTSL hiked to 87.38% from 73.28% at initial stage of investigation. A difference in the contribution on motivation for science learning by six variables could also be inferred between pre and post situations as detailed in the Table 6.

An overall difference of 14.1% was found in motivation for science learning by means of video lessons and quizzes. This could be concluded as the contribution of video lessons and quizzes to the existing learning environment. The variable performance goal (IV), continued to be low comparatively; but contributed highest up

to 33.62% to the overall increase. The active learning strategy which was proven to be creating motivation to the maximum in the pre and post situations sustained its position, with a contribution of 11.84% to the overall increase.

After intervention the students were categorized in to low, moderate and high motivation categories.

A change was evident in the motivation levels of students from a majority in moderately motivated category (91.78%) during pre- intervention period to highly motivated (95.43%) in post intervention period. No student was found in low motivation category during post intervention period.

Table 2. Age profile of the students

n1= 38, n2=15, n3=81, n4=10, n5=50, n6=25

School	Total	11-13 years		14-16 years	
		Girls	Boys	Girls	Boys
JPet	38	28 (73.68)	--	10 (26.31)	--
R Gudem	15	--	6 (40.00)	--	9 (60.00)
Tadvai	81	48 (59.25)	--	33 (40.74)	--
Kalwapally	10	--	2 (20.00)	--	8 (80.00)
AK Ghanpur	50	28 (56.00)	--	22 (44.00)	--
CBPally	25	--	3 (12.00)	--	22 (88.00)
Total	219	104 (47.49)	11 (5.02)	65 (29.68)	39 (17.81)

Table 3. Pre-test results of SMTSL

n1= 38, n2=15, n3=81, n4=10, n5=50, n6=25

Sl. no	School	Mean score						Total	% SMTSL
		I	II	III	IV	V	VI		
1	J Pet	21.24	32.58	21.26	6.21	22.05	25.89	129.24	73.85
2	RGudem	22.13	31.67	19.53	5.73	21.27	25.40	125.73	71.85
3	Tadvai	22.84	32.79	20.09	7.54	20.99	24.16	128.41	73.38
4	Kalwapally	22.20	34.20	21.30	7.90	19.60	23.60	128.80	73.60
5	AK Ghanpur	24.04	31.78	20.00	7.52	21.02	24.34	128.70	73.54
6	CB Pally	22.60	31.96	21.24	8.76	21.16	22.84	128.56	73.46
Weighted Mean score		22.51	32.50	20.57	7.28	21.02	24.37	128.24	73.28
Percentage (%)		12.86	18.57	11.75	4.16	12.01	13.93	73.28	

Table 4. Pre and post quiz scores in physical science and biology video lessons among 8th class students of Ashram Schools

n1= 38, n2=15, n3=81, n4=10, n5=50, n6=25

S. no	School	Physical science (mean score)		% increase	Biology (mean score)		% increase
		Pre-test	Post-test		Pre-test	Post-test	
		1	J Pet	1.74	3.64	38.00	1.44
2	R Gudem	1.56	3.63	41.40	1.34	3.57	44.60
3	Tadvai	1.52	3.55	40.60	1.48	4.07	51.80
4	Kalwapally	1.33	3.92	51.80	1.38	4.18	56.00
5	AK Ghanpur	1.35	3.81	49.20	1.22	4.09	57.40
6	CB Pally	1.51	3.95	48.80	1.61	3.84	44.60

Table 5. Post-test results of SMTSL

n1= 38, n2=15, n3=81, n4=10, n5=50, n6=25

Sl. no	School	Mean Score						Total	% SMTSL
		I	II	III	IV	V	VI		
1	J Pet	31.34	34.87	22.42	15.74	23.34	27.11	154.82	88.47
2	R Gudem	30.93	35.13	22.53	15.00	22.67	27.13	153.40	87.66
3	Tadvai	29.67	34.67	22.15	16.90	22.26	26.37	152.01	86.87
4	Kalwapally	28.60	36.90	22.40	13.80	22.20	26.70	150.60	86.06
5	AK Ghanpur	30.12	35.76	23.08	15.90	23.06	26.90	154.82	88.47
6	CB Pally	30.48	35.16	22.08	16.08	22.04	26.00	151.84	86.76
Weighted Mean score		30.19	35.42	22.44	15.57	22.60	26.70	152.92	87.38
Percentage(%)		17.25	20.24	12.82	8.90	12.91	15.26	87.38	

Table 6. Percentage contribution of SMTSL variables for science learning motivation in pre and post situations

n=219

SMTSL variable	Percent contribution		% difference	% contribution
	Pre scores	Post scores		
I	12.86	17.25	4.39	31.13
II	18.57	20.24	1.67	11.84
III	11.75	12.82	1.07	7.59
IV	4.16	8.90	4.74	33.62
V	12.01	12.91	0.90	6.38
VI	13.93	15.26	1.33	9.43
Total	73.28	87.38	14.10	100.00

Table 7. Percentage shift in motivation categories between pre and post intervention

n= 219

Stage	Category distribution %		
	Low	Moderate	High
Pre SMTSL	1.36	91.78	6.84
Post SMTSL	0	4.56	95.43

4. CONCLUSION

The SMTSL in all schools was above 70%, and showing more or less uniform trend between schools and also between girls and boys. This might be because the students had crossed 6th and 7th classes, where science education already initiated with Science as single subject and in the 8th class exposed to two new science subjects viz., Physical science and Biology. All the schools were high on active learning strategy (II). Learning Environment Stimulation (VI) scored second order, followed by Self-efficacy (I) Achievement goal (V) and Science learning value (III). Learning environment includes the surroundings of students such as curriculum, teachers' teaching, and pupil interaction that influenced students' motivation in science learning. Self-efficacy, which was the belief of students in their own ability to perform well in

science learning tasks, comparatively attained third position. The students from all the schools attained least scores on performance goal. In a way, it appeared to be highly personalized variable where the student ignites oneself for science learning.

The sum of SMTSL hiked to 87.38% from 73.28% in post-test. The variable Performance goal, contributed to the maximum (33.62%). A shift in students from moderately motivated category to highly motivated category was also found in post intervention situation. An increase in post quiz scores in both the subjects was evident from the data. The % increase was high in Biology than Physical science, which was vice versa in pre quizzing situation. Video lessons might have created stimulating learning environment to interact with Biology content while answering the quiz questions.

5. RECOMMENDATIONS

Science learning doesn't alone depend on teaching. Personal attributes like creativity goal orientation, problem solving, achievement orientation, situational etc, play vital role.

While providing motivation, the teacher should take these attributes into consideration, to maximize the support in effective science learning.

CONSENT

As per international standard or university standard, students' written consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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