

## Measuring Students' Attitudes Towards Learning Physics: Experimental Research

<sup>1</sup>Abdul Qadeer Soomro, <sup>2</sup>Prof. Dr. Muhammad Nasim Qaisrani, <sup>3</sup>Manzoor Ahmed Uqaili

<sup>1</sup>Faculty of Education and Learning Sciences, Iqra University, Karachi, Pakistan.

<sup>2</sup>Faculty of Education and Learning Sciences, Iqra University, Karachi, Pakistan.

<sup>3</sup>Faculty of Education and Learning Sciences, Iqra University, Karachi, Pakistan.

---

**Abstract** The Use of 5Es (Engagement, Exploration, Explanation, Elaboration and Evaluation) Learning Cycle Model facilitate students learning in Science. The present study aimed to measure students' ability in using of Science Process Skills through 5Es Learning Cycle Model and Traditional Teaching Method of teaching Physics. The study was experimental in nature. The Pretest- Posttest only group designed was used. The sample of the research was consisted 40 tenth graders among which experimental and control groups were made randomly. The Experimental Group was taught by 5Es Learning Cycle Model while the Traditional Teaching Method was introduced in the Control Group. The result showed that the students in the experimental group made more prone to change their attitude in learning physics subject than the control groups. It is recommended the teacher may incorporate 5Es learning cycle model in teaching physics at Secondary level and physics teachers may interweave existing content of Physics with 5Es model.

**Key words:** Attitude toward physics subject, 5Es learning cycle model, Science process skills.

---

### INTRODUCTION

Physics subject is measured as the most problematic area within the field of science. Teaching of physics in secondary schools traditionally magnetizes fewer learners than other field of science subjects. Teaching of physics seems as a difficult course for students from secondary school to university. Researcher have been related with the profession of teacher education since last sixteen years and during his M.Phil thesis title "Teaching Physics through Learning Cycle Model: An Experimental Research", as a teacher and researchers, his experiences showed that mostly Pakistani students were not able to observe as well as real life examples of inquiry being used in classroom situation and in schools as well as science concepts that they might in their own classroom. Students also were not able to translate the information and shared them with their group in class into demonstration of learning or assessment. We realized that our students were not internalizing the information's we were teaching to our students. Our students were not able to use science process skills i.e. gather, hypothesis, classify, communicate, compare and contrasting or observe and discuss object and events and record observation. They were unable to apply the information to everyday life situation. In Pakistan majority of schools use physics text book for teaching purpose in classroom, the content knowledge delivered in their lectures according to textbook, that textbooks and other instructional materials encourage the rote learning of physics. It contains only passage, some figures showed their activities, problems in exercises their equation and formulas to solve those exercises. Experience shows that physics being taught in the traditional way and the role of teacher only information giver to inert students appears archaic and students cannot take active role in learning. Research shows teacher-center-strategies of teacher has failed to bring about the desired learning outcomes and teacher-centered-teaching of physics curriculum do not authorize students to become self thinkers and expertise for solving complex problem. They do not apply concepts and make their scientific knowledge constant. The lecture method teaching instructions are not satisfy the requirements of the nature of science teaching and nature of learner and do not help students progress from concrete to abstract thinking and do not help them enjoy science, make interest, understand concept and apply it in real life situation, in resulting lecture method is effective for some student may be ineffective for others, some students seem to learn effectively from lecture notes and make interest to subject, while other prefer reading the same material and mostly they will not develop concept and misconception understanding stay last extended. In other hand constructivist learning has been offered as method that supports the teaching process. In constructivist learning method a learning cycle approach can result in greater achievement in science, better retention of concepts, improved attitudes towards science subject and science learning, improved reasoning ability and superior, process skills than would be the case with traditional instructional approaches (Lawson, Abraham & Renner, 1989). The learning cycle approach is the teaching procedure that was invented to satisfy the requirements of the nature of science teaching and the nature of the learner. The five phases called 5Es: (Engage, Explore, Explain, Extend and Evaluation) is an effective way to help students enjoy science, understand content and apply scientific situation. It is advance approach that promotes thinking abilities and meaningful learning. Student towards physics may also play an

---

**Corresponding Author:** Abdul Qadeer Soomro, Faculty of Education and Learning Sciences, Iqra University, Karachi, Pakistan.

E-mail: aqs\_per@yahoo.com; Tel: +92-21-34800671-4; Fax: +92-34987806  
2282

important role in future success and strength of mind in science concepts. Attitude required through learning and can be change through influence using selection of techniques. In teaching learning process an opportunity is created whereby the teacher can talk to the students directly or in small groups. Teacher may raise questions to help direct students or explain concepts. Skilled stage is created by approaches to problem solving and about activities and attitudes, which influence performance in class. Once students are successful they view the subject difficulty with a very positive attitude because their self-confidence is improved. This generates a positive phase of good performance structure higher self-esteem which in turn leads to more interest in the subject and higher performance. The main purpose of this study measure the ability to practice the full cycle of steps (science process skills) and students' attitudes towards physics subject through 5Es learning cycle model and traditional teaching method in teaching of physics in term of student intellectual achievement in public school at secondary level.

***Revelent Literature:***

***Science Process Skills:***

Science process skills are very important from the practice of science and assist central role in both formal and informal learning of science.

According to Padilla's (1990) essay cited in Keil.C., Haney.J. and Zofeel. J., (2009) defined these skills as "transferable activities, appropriate to many science disciplines and reflective of the behavior of scientists." He re-emphasized that science processing includes both basics and integrated skill. Basic processing involves: observing, inferring, measuring, communicating, classifying and predicting. Integrated science process skills require controlling variables, defining terms operationally, formulating hypotheses, interpreting data, experimenting and formulation models. Both skills are needed to scientifically literate. Science process skills are not only important for those pursuing careers in science, but most jobs in this new millennium involve using these skills (Rillero, 1998). While an in-depth knowledge of science content is not possible, mastery of science process skills facilitates students to understand, at a greatly deeper level, the content they do know and trains them for obtaining content knowledge in the future.

Harlen, (1999) define that assessing process skills is not as common as assessing content knowledge, but is can be done.

***Attitude:***

Souza Barros, S. de *et al*, (1987) stated: The word "attitude" taken from the Latin *Aptus* is defined the frame work of Social Psychology as a subject or mental preparation for action. It defines outward and visible postures and human beliefs. Attitude determines what each individual will see, hear, think and do. They are embedded in knowledge and do not become repeated everyday manner. Further describe attitude means the individual's prevailing tendency to respond favorably or unfavorably to an object (Person, group of people, institution or events). Attitude can be positive value (value) or negative (prejudice).

Attitudes are achieved through knowledge and can be changed through assessment using variety of techniques and attitudes change gradually.

Adensina & Kinbobola (2002) describe students/peoples constantly form new attitudes and modify old ones when they are exposed to new information and new experiences.

Gagne (1979) recognized attitude as a major factor in a subject choice, also consider that attitude as a mental and natural state of readiness, organized through experiences exerting a directive influence upon the individual's responses to all objects and situation with which it is related.

In 5Es Learning Cycle Model its phases given an opportunity teacher can talk directly with their students or face to face with small groups and it promote students positive attitude towards instructional activities. When all students are successful in their performances they viewed the subject matter with a very positive attitudes because students self esteem is enhanced and their self esteem which guide to more significance in the subject. During study of research study show 5Es Learning Cycle Model instructions seem in as a successful model in which teaching strategies and use of variety of lessons activities with individuals or in small groups improve their understanding towards subjects. During each component of 5Es Learning Cycle students work with small groups or individual to achieve the purpose, all students in groups help each other in learning the concepts but achievement is evaluate in individually.

If we count students negative attitude towards science mean student don not like physics subject, based on this ground, several key studies done to find out the common factors that affect the students attitudes to sciences subjects. Such as:

- 1) Teaching Styles during teaching.
- 2) Teaching learning strategies
- 3) Graphic Organization and their presentation.
- 4) Career of Science Subjects
- 5) Attitude/Behaviors

- 6) Teacher attitude/behaviors
- 7) Gender Interest.
- 8) Previous learning backgrounds.
- 9) Styles of students such as: Cognitive, Affective and Psychomotor.
- 10) Interest for Job/career.
- 11) Self adequacy
- 12) Success and their achievement.

Both attitude (positive and negative) affect learning in physics subject, if students attitude negative towards certain subjects students learning or future career difficult and other side student positive attitudes towards certain subject that students learning extremely correlate with their achievement.

In constructivist approach through use of five components of Learning Cycle Model are developing the student's positive attitudes towards physics subject and increase the level of attitude and success in achievements and their goals and students' self esteem is enhanced and their self esteem which guide to more significance in the their subject.

Erdemir and Bakirci, (2009) described attitude is tendency for individuals who organize thought, emotions and behaviors towards psychological object. Human beings are not born with attitudes they learn afterwards. Some attitudes are based on peoples own experience, knowledge and skills and some are gained from other sources. However the attitude does not stay the same. It changes in the course of time and gradually.

In 5Es Learning Cycle Model all the students work in groups or individual performance accepts the challenges and find the alternative solutions and use previous knowledge and experience which makes them new knowledge and experience. Organize science process skills change in their attitude and their thought; demonstrate higher cognitive activities and deep scientific understanding. Learning is a internal mental and purposeful, teachers role is facilitate learning by observing and collect data on changes in individuals actual behavioral or hidden performance and capture individuals attention and activate their motivation to learn and connect relevance concepts with students interests, real situation and classroom environment.

Abell and Lederman (2007), describe construction of deep scientific knowledge results from actively practicing science in structured learning environment. Learning environments should support student's active construction of knowledge. Teacher should employ teaching strategies that help learners recognize conflicts and inconsistencies in their thinking as these experiences catalyze the construction of new, more coherent knowledge (Staver, 2007).

Many research studies report that Inquiry activities resulted in positive interest in science and motivation to do science.

Gibson and Chase (2002) reported that inquiry activities not only led to more interest in science but that this interest persisted long after inquiry intervention was over.

The Study showed that if students are more interested in science because of inquiry experiences, they may be more likely to study science in the future continues in science classes.

According to Kolb, "A major function of education is to shape students attitudes and orientations towards learning to instill positive attitude towards learning and thirst for knowledge and to develop effective learning skills" (Kolb, 1984).

From these viewpoints, in this research the main purpose of this study measure the ability to practice the full cycle of steps (science process skills) and students' attitudes towards physics subject through 5Es learning cycle model and traditional teaching method in teaching of physics in term of student intellectual achievement in public school at secondary level.

#### ***Method nd Procedure:***

##### ***Research Design***

In this study pre-test post-test equivalent experiment design was used. 5Es learning cycle model and traditional teaching method were taught in teaching of physics concepts in term of student achievement in public school at secondary level. Forty 10<sup>th</sup> grade students were taken from three classes of physics course. Twenty students randomly selected were assigned in each group experimental and control group. Experiment group were taught by 5Es learning cycle model and control group were taught by traditional teaching method. The study was completed in 2009-2010 Year, 10<sup>th</sup> grade study of Government Qazi Habibullah High School, District Shikarpur. Achievement test based on simple machine was administered to both groups. In order to assess student attitudes towards physics subject and measure different aspects of the science process skills assessment tools were used.

##### ***Research Questions:***

Can 5Es Learning Cycle Model Improve students' Science Process Skills more than Traditional Teaching Method in Physics?

**Hypotheses:**

Es Learning Cycle Model can improve students’ Science Process skills more than Traditional Teaching Method in Physics.

**Procedure:**

The whole research conducted by researcher and the tools also were administered personally by the researcher teacher quality variables was controlled in the study by two teachers to teach on the same contents of the 10<sup>th</sup> grade physics textbook, the chapter was “simple machine” to their respective groups. Both teachers who were provided necessary training and provide with detail instruction and well articulated lessons packages on the chapter topics of simple machines. The control group was instruction by the traditional teaching method instructions and the experimental group was instructed by 5Es learning cycle model instructions. The concepts were using the same outline but with different learning strategies. This study was done using pre-test post-test control group design. The tool for measuring students’ attitude towards physics was given to measure students’ attitude towards physics subject. At the beginning of the instruction and after treatment Science Process Skills test was given to all students in the study to find out whether would be significant difference between the groups. The mean, standard deviation and standard error of means of raw scores of the students on pre and post test were calculated and recorded in Table-1

**Research Instruments:**

Following two instruments were used for gathering the data:

**Attitude Scale Towards Physics Subject:**

Attitude scale towards physics subject was developed by the researcher. This instrument consisted of 16 items in 5 points Likert Scale. The responses were specified: Strongly Agree, Agree, Neutral, Disagree and Strongly Disagree respectively allocate each value point of as 5, 4, 3, 2 and 1 for positive and reverse sort for negative responses. The content validity of items was assessed at the time they were arranged by tow physics experts and on an educational psychologist. The reliability was found to be .73. This tool was given to all students in both groups to measure the students’ attitude towards learning. See (Appendix-A).

**Science Process Skills Test:**

Bourdeau and Arnold (2009) Science Process Skills instruments used for measure the students’ ability to improving Science Process Skills. The test was adopted from the Mary E. Arnold and Virginia Bordeaux Oregon State University, 4-H Youth Development, with permission to use instrument in Sindhi Language. It was translated in Sindhi Language. The test consists of 11 items each representing a different skill in science inquiry process in 4 Point Likert Scale indicating Never (1), Some Time (2), Usually (3) and Always(4). The reliability was found and stated (i). Split Half Reliability (Spearman-Brown) was .93 and (ii). Cronbach’s Alpha calculated pre and post program. The reliability coefficient was found to be .84, see (Appendix-B).

**Result:**

**Analysis of Data:**

Data was done online on the [Website] at [www.graphpaid.com](http://www.graphpaid.com) hypothesis was used to analyze the data. The hypothesis was tested at significance level 0.05 and t-test was used to test the hypothesis. The score for Science Process Skills for data collection as shown in Table1, the statistical technique identified the students’ involvement of Science Process Skills; t-test statistics was used. Students’ attitude towards physics subject the data of both groups were arranged and analyzed in percentage. This is shown in Table.2.

**Table 1:** Sample t-test Comparing the pre-test and post-test of Attitude Scale and Science Process Skills test.

	N		Groups	$\bar{X}$	SD	SEM	Df	t Cal. Value	t Tab. Value	P Value
Science Process Skills	20	Pre-test	EG	27.20	4.94	1.10	19	0.0917	2.093	0.9279
			CG	27.30	3.56	0.80				
	20	Post-test	EG	39.70	2.52	0.56	19	8.3900	2.093	0.0001
			CG	32.45	4.33	0.97				

\_(N for Number of Student, X for Mean, SD for Standard Deviation, SEM for Standard Error of Mean, Df for Degree of Freedom, p for Significance Value)

**Interpretation of Data and Findings:**

In regard Students’ ability improving in science process skills the result of both groups in pre-test was same and in post-test was different. The result is shown in Table-1. In the post-test of both groups there was extremely statistically difference was found (t = 8.3900, p > 0.05). The both group’s involvement and understanding of science process skills was greater than before. The mean of the EG (39.70) was significantly higher that of CG

(32.45) on the post test. By conventional criteria, this difference is measured to be extremely statistically significant. Hence null hypothesis has rejected. Thus it means that 5Es Learning Cycle Model instruction enhance science process skills and motivate among students to understanding the concepts happily. In order to become skilled at meaningfully and make interest among students, the experimental group should link between new and existing knowledge, so this should be taken into account for an effective teaching and student's understanding and their involvement in science process skills. In other hand mean score of CG (32.45) showed poor result, it indicates that student's level of involvement and understanding of science process skills in not increased through Instruction Based Lecture Method their improvement level was also low. It means that through Instruction Based Lecture Method it is complicated to create positive learning background. The analysis of the data also support the study is statistically significant. However, the students' involvement in science process skills and their understanding in science concepts were increased in Instruction Based 5Es Learning Cycle Model group.

**Table 2:** Percentages of the scores in attitude scale of control group and experimental group.

	Level-1		Level-2		Level-3		Level-4	
	Interest towards Physics Subject		Importance of Physics Subject		Feel Difficulties of Physics		Subject taken as a Future Career	
	CG	EG	CG	EG	CG	EG	CG	EG
	91	93	54	84	70	90	56	83
	57	75	75	88	53	81	58	80
	77	89	77	88	64	92	81	95
	84	88	80	88				
	60	84	75	90				
$\Sigma X$	369	429	361	438	187	263	195	258
Percentage (%)	36.9%	42.9%	36.1%	43.8%	31.1%	43.85%	32.5%	43%

( $\Sigma X$  for Scores, CG for Control Group and EG for Experimental Group)

The result showed that students' had different attitude towards physics subject in different levels. On the questions of physics being made Interest towards physics subject control group representing 36.9% and the experimental group representing 42.9%, on the questions of physics being a importance of physics subject and use in daily life control group representing 36.1% and the experimental group representing 43.8% , on the questions being made for feel difficulties towards physics subject the control group representing 36.1 and the experimental group representing 43.85 and the questions of physics being a subject taken as a future career the control group representing 32.5% and the experimental group representing 43%. The result is shown in Table 2. The result showed that the students in the experimental group made more constructivist approach in attitude in learning physics subject then the control groups.

**Recommendations:**

On the basis of finding following suggestions are recommended:

1. 5Es Learning Cycle Model may be employed into teaching of Physics at secondary school level.
2. Science Process Skills may be included in the textbooks of all level.
3. Course of Physics must be taught conceptually understanding through 5Es Learning Cycle Model and related activities may be arranged through Science Process Skills as students Observe, Solve Problems, Infer, Make Hypotheses, Organize Charts and Concept Mapping and expand their knowledge with other groups member and connect it in their daily life.
4. School teacher should build up positive attitude with learners and interest classroom activities, which will utilize active teaching learning process and students' participation in the class.
5. The school administration committee and science teachers designed to promote positive attitude towards physics subject.
6. The school teacher and training college teacher must be skilled to use instructional material according to science inquiry process and prepare their instructional lesson plan according to 5Es Learning Cycle Model.
7. Make efforts about students interest and attitude towards physics subject may be shaped in the beginning of studies.
8. Student himself must perform the practice Science Process Skills and develop the skills of learning.
9. The physics teacher should be joining professional Development Program from time to time as they increase their skills in Science Process Skills and Knowledge of Physics.
10. For the interest and attitude towards physics subject and the involvement of the student to Science Process Skills, it would be compulsory that encourage Science Process Skills and teacher should be exercise to their instructions in classroom, so as they solve the problem of dropout of students from secondary school level.

### Conclusion:

The present research study showed that Instruction Based 5Es Learning Cycle Model instruction is more effective method in enhancing student attitude towards physics subject and engage more students in Science Process Skills than the Instruction Based Traditional Teaching instruction. In 5Es Learning Cycle Model the instructional activities were developed and prepared Science Process Skills according to the Science Inquiry Process, which help students, develop their own frame of thought and it is effective in the classroom teaching. Each student will observe, hear, imagine, act and construct their own knowledge. Involving students in Science Process Skills will enable them to understand the concepts more clearly, enjoy and construct more positive attitude towards physics subject. Students are more successful in their performance, they viewed the subject matter with very positive attitude because students self esteem are enhanced and their self esteem which guide to more significance in the subject.

The result showed that during Instruction Based 5Es Learning Cycle Model use of verity of lesson plans activities with small group of students develop their understanding and build interest towards subject, the Science Process skills resulted in positive interest in physics subject and motivated to carry out science. The result showed that the students in the experimental group made more constructivist approach in attitude in learning physics subject then the control groups. It is recommended the teacher may incorporate 5Es learning cycle model in their teaching practice and let their students improve their constructive attitude towards physics.

### REFERENCES

- Abell, S.K., N.G. Lederman, eds, 2007. *Handbook of research on science education*. Mahwah, NJ: Lawrence Erlbaum Associates, Publishers.
- Adesina, A.O. and A.O. Akinbobola, 2005. The attitudes of students towards part time degree program of faculty of education, Obafemi Awolowo University, Ile-Ife. *Journal of Research of Education*, 2(1): 1-4.
- Bourdeau, V.D. and M.E. Arnold, 2009. *The Science Process Skills Inventory*. Corvallis, OR: 4-H Youth Development Education, Oregon State University.
- Erdemir, N. and H. Bakirci, 2009. The change and development of attitude of science teacher candidates towards branches, *Kastamonu Education Journal*, 17(1): 161-170.
- Gagne, R.M., 1979. *The conditions of learning* (3<sup>rd</sup> Edition), New York: Holt Rinehart and Winston.
- Gibson, H. and C. Chase, 2002. Longitudinal impact of an inquiry based science program on middle school students' attitudes towards science. *Science Education*, 86(5): 693-705.
- Harlen, W., 1999. Purposes and procedures for assessing science process skills. *Assessment in Education: Principles, Policy and Practice*, 6(1): 129.
- Keil, C., J. Haney and J. Zofeel, 2009. Improvements in Student Achievement and Science Process Skills Using Environmental Health Science Problem-Based Learning Curricula., *Electronic Journal of Science Education* Volume 13, No. 1 © 2008 Electronic Journal of Science Education (Southwestern University) Retrieved from <http://ejse.southwestern.edu>.
- Kolb, D.A., 1984. *Experiential Learning Experience as the Source of Learning and Development*. New Jersey: Prentice Hall. Inc.
- Lawson, A.E, M.R. Abraham and J.W. Ranner, 1989. A theory of instruction: using the learning cycle to teach science concepts and thinking skill. Kansas State University, Manhattan, KS: National Association for Research in Science Teaching.
- Padilla, M.J., 1990. Science Process Skills. *National Association of Research in Science Teaching Publication: Research Matters - to the Science Teacher* (9004).
- Rillero, P., 1998. Process skills and content knowledge. *Science Activities*, 35(3): 3.
- Souza Barros, S., de et al., 1987. *How do science teachers view their philosophy of science and their process approach to teaching sciences at secondary level*, Communication, VII Simpósio Nacional de Ensino de Física, São Paulo, Brasil. Available website <http://www.physics.ohio-state.edu/~jossem/ICPE/D2.html>.
- Staver, J.R., 1998. Constructivism: Sound theory for explicating the practice of science and science teaching. *Journal of Research in Science Teaching*, 35: 501-520.
- Staver, J.R., 2007. *Teaching Science*, The International Academy of Education (IAE), Educational Practices Series-17, p: 15, printed in by Imprimerie Nouvelle Gonner, 01300 Belly, France, available website <http://ibe.unesco.org/publications.htm>.

### Appendix A:

#### Questionnaire About Attitude Towards Physics Subject:

پيارا ڀارو: هي سوالنامو تحقيقي پروگرام کي ڪامياب بنائڻ ۾ توهان جي مفيد سوچ معلوم ڪرڻ لاءِ ترتيب ڏنو ويو آهي. تنهنڪري اوهان کي عرض آهي تہ هيٺ ڏنل سوالن کي چڱيءَ طرح پڙهي پوءِ مڪمل ڪريو. جيئن تحقيقي پروگرام کي وڌيڪ بهتر بنائي سگهجي. مهرباني ڪري هيٺ بيان ڪيل جملن سان توهان کيترو متفق آهيو، ان لاءِ هيٺ ڏنل پنج نڪاتي پيمانو استعمال ڪريو ۽ هر هڪ بيان جي ڪنهن به هڪ نمبر کي (√) ڪريو.

پنج نکاتي پيمانو:

5	4	3	2	1
بلڪل متفق آهيان	متفق آهيان	غير جانبدار	غير متفق آهيان	بلڪل غير متفق آهيان

سيٽ نمبر: ( )

1	2	3	4	5	سيريل نمبر
					1
					2
					3
					4
					5
					6
					7
					8
					9
					10
					11
					12
					13
					14
					15
					16

Appendix B:

Questionnaire About Science Process Skills:

پيارا ٻارو: هن سولنامي ذريعي اهو ڄاڻڻ جي ڪوشش ڪجي ٿي ته اوھان ڪيترا سٺا سائنسدان آھيو! مھربان ڪري ھيٺ ڏنل چار نکاتي پيماني جي ھڪ خاني ۾ نشان (√) لڳايو جيڪو اوھان جي سائنسي ڪوجنا جي ڪم ڪرڻ جي موجوده مھارت کي ظاھر ڪري.

چار نکاتي پيمانو:

4	3	2	1
ھميشه	اکثر طور	ڪنھن مھل	ڪڏھن به نه

سيٽ نمبر: ( )

1	2	3	4	سيريل نمبر
				1
				2
				3
				4
				5
				6
				7
				8
				9
				10
				11