



# Indian Journal of Hill Farming

December 2023, Volume 36, Issue 2, Pages 01-07

## Innovative teaching by kinesthetic learning activity and its problem factors: Physics in agriculture

Soma Roy Acharjee<sup>1</sup> • Anuradha Bhattacharya<sup>2</sup> • L. Hemochandra<sup>3</sup>

<sup>1</sup>Corresponding author, Director, New Edge Programme, Techno India Group, Kolkata, -700091 India, email: [sraphd.2022@gmail.com](mailto:sraphd.2022@gmail.com), #7003808781

<sup>2</sup>Asst. Professor, Techno India University, Kolkata, West Bengal, 700091 India,

<sup>3</sup>Professor in Agri. Statistics, CPGS, CAU (I), Umiam, Meghalaya 793104, India

### ARTICLE INFO

#### *Article history:*

Received: 15 September, 2023

Revision: 02 October, 2023

Accepted: 30 November, 2023

*Key words:* Problems, Garrett, KLA, Physics, Agriculture

DOI: 10.56678/iahf-2023.36.02.1

### ABSTRACT

The present study attempts to find out the problems faced by the students in understanding Physics through Kinesthetic Learning Activity. Present day students lack clear concepts in the subject Physics and its uses in terms of Agriculture and thus it becomes important for the educator to devise innovative methods of teaching; like the Kinesthetic Learning Activity. However, administering KLA had some problem factors, which were ranked. 45 responses from Class XI Science students were collected with the help of an online questionnaire and were analyzed using Garrett's Ranking Technique to obtain the highest rank in the problem. Findings show that 'difficult to picturize certain topics' is the most important factor followed by 'lack of adequate time for conducting activity' in the class among the 13 possible problem factors.

### 1. Introduction

In the schools in India the pedagogy of teaching Physics is more of a lecture method delivery with limited experiments on board. Research has shown that this method suffers from many drawbacks like "decreased student engagement, frequent student inattention, and the exclusion of nonverbal learning modalities". Hence, the students rely on rote learning rather than conceptualizing the concepts. Students tend to learn best when an array of learning styles is used by instructors. (Califf, C. B.2020)

Research says students learn better when on the move! Students are fast learners, better retainers, can build excellent neural networks thus can manipulate information more effectively when they are in active physical motion. Many authors argue that students' conceptions of basic physical phenomena are rooted in basic schemas, originating in fundamental kinesthetic experiences of being. (Erwin, H, Weight, E., Harry, M., 2021) This paper mainly researches one such innovation, the kinesthetic learning activity. Kinesthetic Learning Activity (KLA) (Sivilotti and Pike, 2007) is defined as "any activity which physically engages students in the learning process". KLAs is sometimes referred to in literature as simulation role play or analogical modeling

role play. The term Pedagogy is used to describe theories and methods of teaching utilizing different techniques of teaching. Practice of appropriate strategies, considering individual differences and engaging the learners into social interaction between each other and between their teachers may be regarded as the main target of the pedagogical components (Shireen, 2018).

KLAs can positively affect the culture of interaction in the classroom, encouraging student participation and collaboration. There is evidence to suggest kinesthetic learning may prove especially beneficial to at-risk students. KLAs draw new ideas in the minds of the students, and serve as useful formative assessment tools for instructors, thus helping in monitoring the learning process (MOEGOI, 2021). It is believed that experiential learning combines auditory, visual, and kinesthetic learning to allow students to use all of the senses to better comprehend the content and thus the use of experiential learning in the classroom enhances student comprehension (Austin, 2015). By incorporating experiential learning activities into the lesson plans, students found it easier to recognize concepts being taught and remained focused longer by switching class activities from regular instruction to experiential learning.

\*Corresponding author: [sraphd.2022@gmail.com](mailto:sraphd.2022@gmail.com)

And finally, these activities induce great deal of excitement and enthusiasm into the classroom and the topics dealt are etched in the memory with clarity and depth. Considering the young farmer teacher or regular secondary agricultural teacher that teaches adults is also expected to present and/or organize educational classes and activities for participants, it is important to determine the best teaching methods for presenting these programs to participating adults (Bailey, et. al., 2017). There is a particular sensual quality to the process of theatre creation that could be harnessed in fieldwork with seasonal Agricultural Worker Program workers. The politics of intimacy permeates workers lives in the workplace. Seasonal workers spend the majority of their time engaging their bodies in a deeply kenesthetic activity that over time this becomes memory in their bodies (Samudra, 2008). KLA's has been effectively used in Computer Science courses (Anderson, 2001) but very few researches on Physics courses has been conducted. This paper aims to answer the question if there is any remarkable difference in understanding the basic concepts of Physics which cannot be demonstrated or experimented at the school level when applying the contemporary and traditional lecture method with that of the KLA method.

## 2. Methodology

The study was carried out at the Techno India Group Academia, Survey Park in South 24-pargana and Techno India Group Public School, Ariadaha in North 24-pargana by applying Multistage sampling. West Bengal is selected purposively at the first stage for the research work since it is under the Techno India University, the first private university in Kolkata, the capital city of West Bengal, India which is a part of the Techno India Group; a renowned conglomerate of Sschools, Ccolleges and Universities which caters from playgroup to PhD. mainly in the state of West Bengal. The next step to select the region comprises of South 24-pargana and North 24-pargana districts since it is the highest educational hub in this area. From the selected districts, some schools are listed and one school is selected randomly from each district. This study was conducted

during the month of May-June, 2023. In a Physics workshop for teachers, they were asked to identify problems which are the ruling factors as to why the students do not understand Physics as well as they understand other subjects. Such 20 points were identified of which based on the review of literature, 13 problem factors which are faced by the students were selected for the study. With the help of an online questionnaire these 13 problem factors were shared to the respondents which consisted of students from Class XI in Science stream with Physics major. A total number of 45 such students responded through an online survey. Students were asked to identify the ranks of the problems faced based on their personal experiences. Thus, the constraints were given numerical scores and statistically it was then analyzed for quantitative approach. To determine the most influencing factors faced by the students, Garrett ranking (Garrett and Woodworth, 1969) was followed. This method qualifies as an excellent tool since the severity is judged from the angle of the respondents.

Respondents were asked to rank their degree of importance such that the most important factor will be ranked first, the next influencing factor as rank second and so on. The outcome of the ranking was converted into percent position and ranked with the help of the following formula

$$\text{Percent position} = \frac{100 (R_{ij} - 0.5)}{N_j}$$

Where,

$R_{ij}$  = Rank given for the  $i^{\text{th}}$  variable by the respondent

$N_j$  = Number of variables ranked by  $j^{\text{th}}$  respondent.

Then, the percent position calculated was converted into scores with the help of Garret's table. The scores of each individual corresponding to their rank were added and the total mean values of scores were calculated. The most important factor is the value having the highest mean value. The table given below represents the problems of the students in understanding Physics. It was given by them at random according to the questionnaire.

**Table 1.** Problem factors which are faced by the students

Sl. No.	Problem	Ranks given by the Respondents												
		1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>	7 <sup>th</sup>	8 <sup>th</sup>	9 <sup>th</sup>	10 <sup>th</sup>	11 <sup>th</sup>	12 <sup>th</sup>	13 <sup>th</sup>
1	lack of experiential training	6	4	10	4	3	3	1	0	2	2	0	2	8
2	difficult to picturize certain topics	11	11	5	2	0	3	0	3	3	1	1	3	2
3	lack of adequate time for conduction activity in the class	5	6	6	4	4	2	2	1	4	4	4	2	1

4	lack of proper management of A-V aids	3	1	3	11	2	1	5	1	4	3	3	3	5
5	lack of expertise teacher in Kinematics system of learning	0	2	3	2	8	7	2	5	4	3	4	3	2
6	lack of activity experiences within the school curriculum	2	3	2	2	6	7	9	3	2	1	4	3	1
7	time constraints due to syllabus completion	2	3	4	5	4	3	7	5	5	1	2	2	2
8	tough subject: only beneficial for fast learners	2	4	1	2	5	5	4	7	3	6	2	3	1
9	conceptualizing the tough topics	7	1	1	4	6	3	1	3	8	6	2	3	0
10	lack of space	5	3	2	3	4	1	2	3	2	6	8	1	5
11	require high cost of investments in labs	1	4	2	1	0	3	6	7	2	3	9	3	4
12	lack of knowledge about KLA application	0	3	4	2	1	2	3	3	4	4	4	12	3
13	lack of social environment about KLA	1	0	2	3	2	5	3	4	2	5	2	5	11

#### The percent positions and Garrett's values

By using Garrett's Ranking formula, percent positions for the ranks were calculated. Using the Garrett's table, percent position of Garrett's values was obtained corresponding to their ranks which are given in Table 2. For the first problem identified the Garrett's value was found as 84, the second problem was 74 followed by 67, 62 and so on.

**Table 2.** Percent positions and Garrett's values

Sl. No.	$100(R_j - 0.5) / N_j$	Calculated value	Garrett's Value
1	$100(1-0.5)/13$	30846	84
2	$100(2-0.5)/13$	11.538	74
3	$100(3-0.5)/13$	19.231	67
4	$100(4-0.5)/13$	26.923	62
5	$100(5-0.5)/13$	34.615	58
6	$100(6-0.5)/13$	42.308	54
7	$100(7-0.5)/13$	50.000	50
8	$100(8-0.5)/13$	57.692	46
9	$100(9-0.5)/13$	65.385	42
10	$100(10-0.5)/13$	73.077	38
11	$100(11-0.5)/13$	80.769	33
12	$100(12-0.5)/13$	88.462	26
13	$100(13-0.5)/13$	96.154	16

### Calculation of Garrett's value and Ranking

The calculation of Garrett's average score and ranking of the problems faced by students are shown in Table 3.

**Table 3.** Calculation of Garrett's score and Ranking

Sl. No.	Problems	Ranks given by the respondents													Total	Average	Average Score	Rank
		1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>	7 <sup>th</sup>	8 <sup>th</sup>	9 <sup>th</sup>	10 <sup>th</sup>	11 <sup>th</sup>	12 <sup>th</sup>	13 <sup>th</sup>				
1	lack of experiential training	504	296	670	248	174	162	50	0	84	76	0	52	128	2444	188.00	54.31	3
2	difficult to picturize certain topics	924	814	335	124	0	162	0	138	126	38	33	78	32	2804	215.69	62.31	1
3	lack of adequate time for conduction activity in the class	420	444	402	248	232	108	100	46	168	152	132	52	16	2520	193.85	56.00	2
4	lack of proper management of A-V aids	252	74	201	682	116	54	250	46	168	114	99	78	80	2214	170.31	49.20	8
5	lack of expertise teacher in Kinematics system of learning	0	148	201	124	464	378	100	230	168	114	132	78	32	2169	166.85	48.20	9
6	lack of activity experiences within the school curriculum	168	222	134	124	348	378	450	138	84	38	132	78	16	2310	177.69	51.42	6
7	time constraints due to syllabus completion	168	222	268	310	232	162	350	230	210	38	66	52	32	2340	180.00	52.00	5
8	tough subject: only beneficial for fast learners	168	296	67	124	290	270	200	322	126	228	66	78	16	2251	173.15	50.02	7
9	conceptualizing the tough topics	588	74	67	248	348	162	50	138	336	228	66	78	0	2383	183.31	52.96	4
10	lack of space	420	222	134	186	232	54	100	138	84	228	264	26	80	2168	166.77	48.18	10
11	require high cost of investments in labs	84	296	134	62	0	162	300	322	84	114	297	78	64	1997	153.62	44.38	11
12	lack of knowledge about KLA application	0	222	268	124	58	108	150	138	168	152	132	312	48	1880	144.62	41.51	12
13	lack of social environment about KLA	84	0	134	186	116	270	150	184	84	190	66	130	176	1770	136.15	39.33	13

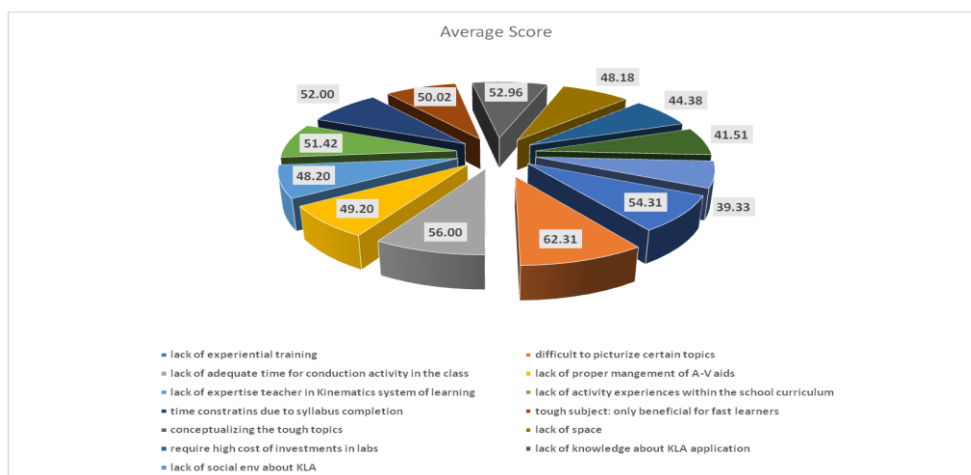


Figure 1. Pie diagram of average scores using Garrett's Score

### 3. Results and discussions

Students have their preferential ordering of the ranked problems at the initial stage. On analyzing their response the percent positions and Garrett's values were obtained. The calculation of Garrett's average score and ranking of the problems faced by students was calculated using the Garrett's table. Among the 13 factors, "Difficult to picturise certain topics" is the major problem with the highest character score 2804 and average score of 62.31, the second highest Garrett score is 2520 with average score 56.00, the lack of experiential training occupies the third place with total score 2444 and average score 54.31. The last but one value is lack of knowledge about application, it's total score is 1880 and average score is 41.51. The least score is the lack of social environment with total score is 1770 and average score is 39.33. The total score, average score and Garrett average score of different problems are shown in table 3.

Kinesthetic learning activity is one such tool where the children actively participate in the school environment while simulating the situation themselves. KLA creates a clear conceptualization of the topics and further enhances the affinity towards the subject due to active participation. However, it has been observed that there are many constraints in realizing the Kinesthetic learning activity for Physics in the school environment. Based on the problems identified by educators and literature survey 13 unranked problems factors were identified as given below:

The factors are

1. Lack of experiential training
2. Difficult to picturize certain topics
3. Lack of adequate time for conducting activity in the class
4. Lack of proper management of AV aids
5. Lack of expertise teacher in kinematic system of learning
6. Lack of activity experiences within the school curriculum
7. Time constraints due to syllabus completion
8. Subject only beneficial to fast learners

9 Conceptualizing the tough topics

10 Lack of space

11 Require high cost of investment in labs

12 Lack of knowledge about KLA application

13 Lack of social environment about KLA

Among the 13 factors, "Difficult to picturise certain topics" is the major problem with the highest character score 2804 and average score of 62.31, the second highest Garrett score is 2520 with average score 56.00, the lack of experiential training occupies the third place with total score 2444 and average score 54.31. The last but one value is lack of knowledge about application, it's total score is 1880 and average score is 41.51 the least score is the lack of social environment with total score is 1770 and average score is 39.33 the total score, average score and Garrett average score of different problems are shown in table 3.

A lucid view of the problems is given below for further in depth knowledge based on the ethnographic approach.

1. Difficult to picturise certain topics: Physics is the basis of all Science, with Chemistry and Biology being the applied streams to Physics. The inner understanding of the phenomenon in Physics is abstract and not all students can relate to the topics easily. The phenomenon which cannot be visualized needs to be brought in front of the students in visual form, and what better method can we have but students thinking in real time about how the objects would respond in the scenario and themselves behave like one.
2. Lack of adequate time for conducting activity in the class: Students spend approximately 6 (six) hours in the School environment. As per norms classroom teaching has to be completed within the scheduled time frame of students staying in school. However, school is where the children are taught not only

- Physics as a subject but simultaneously for holistic development of the students many other activities and subjects also need to be taught and completed within the time frame which leads to the constraint of time management. Thus, many a time's conducting Kinesthetic Learning Activity for Physics becomes a leisure activity in the mindset of the instructors.
3. Lack of experiential training: Every new concept must be well researched and scientifically developed based on which standardized training module must be created. However, Kinesthetic Learning Activity for Physics is in its nascent stage. It is less researched and ill documented. Hence proper guided training is not available for both instructors which would aid in rendering fruitful KLA to the learners.
  4. Conceptualizing the tough topics: In a research with 150 students, Physics was identified by 44% students to be a tough subject to relate. This clearly indicates there is a mental block which has developed in the students against the subject Physics. This could affect their understanding of Physics to a large extent and thus Physics scores would be affected. So, to overcome this mental block one innovative method is to introduce the Physics topics by KLA method which would make the topics easily understood and relatable.
  5. Time constraints due to syllabus completion: The Physics syllabus in senior secondary school covers an array of topics spread over from Mechanics to Thermodynamics, Nuclear Physics to Electronics and Communication systems. This vast spread has to be completed within the stipulated time period; which leads to the stress of syllabus completion in the minds of the educators. Taking into view the holidays and assessments which also fall in the given academic year the syllabus completion with Kinesthetic Learning Activity for Physics is a challenge indeed.
  6. Lack of activity experiences within the school curriculum: School is where we aim at holistic all round development of a child. Hence, the School curriculum has been heavy on activities spread over various areas like dance, drama, extempore etc. Hence performing Kinesthetic Learning Activity for Physics becomes difficult within school curriculum. However, every problem has a solution; so research must be conducted and devised to find a better way of integrating other activity based learning with the KLA method of teaching Physics.
  7. Subject only beneficial to fast learners: There is a mental condition in Indian Parenting which has developed over the years about the career option for their children. Doctors, Engineers and Scientists are the few first career options that come in the minds of the parents fraternity. Craze for Physics and Sciences, especially in the parents fraternity, leads to forcing many slow learners in the Science stream with Physics as the major subject. However, it is very difficult for the slow learners to understand the abstractness of Physics within the stipulated time frame. The fast learners can grasp the topics easily. For better and faster understanding of Physics KLA is an excellent method.
  8. Lack of proper management of AV aids: In India more than 83% of the total schools are located in rural India. The remaining 17% schools in urban India are also not as affluent as expected. Hence only the basic requisites to conduct a school are only available. Not all schools are provided with AV and other machine aids and thus KLA performance aided with machines should be avoided. However, KLAs in Physics can be devised without the use of Audio-Visual aids.
  9. Lack of expert teachers in the kinesthetic system of learning: The teacher-educators in the Indian system are exposed to this Kinesthetic Learning Activity for Physics very recently. Since it is a new field and not much training module is present based in this field the teacher-educators lack the expertise in conducting KLA in Physics along with classroom management. Hence, they need to be trained first with the techniques of KLA ensuring classroom management, time management etc.
  10. Lack of space: Ideally the student teachers' ratio should not exceed 30:1 in the school. In addition to this there must be 2 teachers per section, excluding principal, physical education teacher and counselor to teach various subjects. However, the Indian school system is overpopulated in student strength spread over a very limited space. Hence the dimensions of a classroom or School field is not sufficient enough for conducting Kinesthetic Learning Activity for Physics.
  11. Require high cost of investment in labs: One possibility to make Physics more understandable and relatable is to conduct experiments in the school environment along with the delivery of topics. This needs setting up of well-equipped labs catering to all the topics ranging from Mechanics to Thermodynamics to Nuclear Physics to Electronics and Communication systems that are there in the syllabus. Setting up such a well-equipped laboratory is cost effective. However, this point has received a very low score since it is not a perspective which learners can relate to.

12. Lack of knowledge about KLA application: The KLA system needs to be inbuilt in the Schooling system and every unit must be made aware of the KLA applications. The application of KLA needs a lot of coordination in the school system as there must not be overlapping of utilizing the school field or AV room or any other requisites. This needs proper planning for the execution of the Kinesthetic Learning Activity for Physics.
13. Lack of social environment about KLA: The greater perspective of the student -teacher-parent community and other social environment responsible scored the least score since at the core society always supports learning so if Kinesthetic Learning Activity for Physics is beneficial to students social environment will never oppose the same.

#### 4. Conclusion

The Garrett's Ranking method gives the highest mean value indicating the important factors in studying the problems faced by the students in studying Physics through KLA method. Students have their preferential ordering of the unranked problems at the initial stage, which was ranked using Garrett's Ranking. According to this ranking "Difficult to picturize certain topics" is the first rank which is followed by "lack of adequate time for conducting activity in the class". The last factor influencing the students is "Lack of social environment about kinesthetic learning activity" the study may be used by policy makers to find solutions to the conduction of KLA in the classroom situation thus enhancing the knowledge of the students and making Physics more relatable subject even in the field of agriculture.

#### 5. References

- Anderson LW, Krathwohl DR and BS Bloom (2001) A taxonomy for learning, teaching, and assessing: A revision of Bloom's Taxonomy of educational objectives (Complete ed.). Longman.
- Austin M (2015) Developing an Experiential Learning Program: Milestones and Challenges (D. Rust, Ed.). International Journal of Teaching and Learning in Higher Education, 27(1): 143-153.
- Bailey BS, Lindner JR, and Parr B (2017) An Examination of Georgia Young Farmer Program Participants' Learning Style Preferences. Journal of Human Sciences and Extension, 5(3): 51-57.
- Califf CB (2020) Incorporating Kinesthetic Learning into University Classrooms: An Example from Management Information Systems, Journal of Information Technology Education: Innovations in Practice, 19: 31-45.

- Erwin H, Weight E, Harry M (2021) Kinesthetic activities in physics instruction: Image schematic justification and design based on didactic situations. 91:9.
- Garrett HE and Woodworth RS (1969). Statistics in Psychology and Education. Vakils, Feffer and Simons Pvt. Ltd., Bombay, 329.
- Ministry of Education Government of India (MOEGOI), (2021). <https://www.education.gov.in> › mhrd › files.
- Samudra J (2008) Memory in the body: thick participation and the translation of kinesthetic experience. American Ethnologist, 35(4): 655-681.
- Shireen Mostafa AA (2018) The effect of using some Kinesthetic activities on Developing EFL language performance for the Primary Governmental Language stage students, a published thesis submitted to Ain Shams University, Egypt.
- Sivilotti PA and Pike SM (2007) "The suitability of kinesthetic learning activities for teaching distributed algorithms," ACM SIGCSE Bull. 39 (1): 362–366.