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STUDENTS' RESPONSE TO THE USE OF TRACKER SOFTWARE IN PHYSICS LABORATORY

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Prakticum, software tracker, projectile motion

ABSTRACT

This research aims to evaluate how physics education students respond to the use of tracker software in the implementation of physics laboratory experiments covering projectile motion. The study was conducted in the physics laboratory at the Universitas Kristen Indonesia Toraja (UKI Toraja) and involved 10 (ten) physics education students. Research data were obtained through questionnaires and analyzed quantitatively by calculating percentages. The utilization of tracker software in the implementation of projectile motion experiments enables students to easily observe and analyze the phenomenon of projectile motion. Students feel that experiments on projectile motion using tracker software are relatively straightforward to understand and learn. The results of student responses to the implementation of physics laboratory experiments involving tracker software in projectile motion show an approval rate of 64.4%. Therefore, it can be concluded that students exhibit a positive response and agree with the use of tracker software in physics laboratory experiments.

INTRODUCTION

Physical science is an essential foundation in the field of knowledge and technology, which facilitates the understanding of natural phenomena and the associated software development potential. In the process of learning physics, students are required to apply scientific methods to test the theories that have been presented. Through practicum, students are expected to be able to test and apply the theories that have been learned, to improve students' cognitive abilities and motor skills (Karanggulimu et al., 2017).

Practicum refers to a series of learning stages where educators guide students to observe objects, conduct analysis, test theories, and compile conclusions or reports based on the results of observations made (Rahmawati et al., 2022). In the context of physics, practicum is usually carried out in a physics laboratory, requiring adequate equipment to carry out observations.

In modern times such as the 5.0 era, there are many supporting factors in the learning process, which include not only classroom learning, but also in practicum activities, which include the use of video tracker analysis software. Tracker software has become popular among students of physics study programs, as seen at Yogyakarta State University, where tracker software has become an important addition in the implementation of Science Pralktikum 1, accompanied by a guidebook "Tutorial on Using Tracker Software for Motion Analysis of Objects" (Learning Model Classification | Institute for Education Development and Quality Assurance - Universitas Amikom Purwokerto, n.d.). However, it should be noted that among physics education students at UKI Toraja, the use of tracker software has not been implemented.

The advantage of tracker software is its availability as a free download without the need to pay or subscribe, so this software can be easily accessed, and some many guides or tutorials allow users to learn it independently (Gultom et al., 2021), (Marliani et al., 2015), (Pratiwi, 2016). On the other hand, the weakness of tracker software is its limitation in terms of

compatibility, because it can only be run on computer devices that use Windows and macOS operating systems (Syaepudin, 2018).

The way software tracker works involves analyzing videos or images to identify parameters such as object speed, gravitational acceleration, momentum, and other elements (Rizki et al., 2021), (Situmeang et al., 2019). One example of physical material that can be analyzed using software trackers is the parabolic movement of an object.

Parabolic motion involves two velocity components, which are parallel to the x-axis and perpendicular to the y-axis. The velocity of objects on the x-axis is always consistent, both in magnitude and direction (Josephine, 2020). Conversely, the speed of objects on the y-axis will experience deceleration according to the influence of gravitational acceleration (Santoso &; Winarti, 2019).

In parabolic motion experiments, we can identify the acceleration of objects, the speed of objects, the position of objects at a given moment, and generate relevant linear equations (Raflesiana et al., 2019), (Rajagukguk &; Sarumaha, 2019). Based on the previous description, the purpose of this study is to assess the response and evaluation of students to experiments using a tracker software application for parabolic motion material.

RESEARCH METHOD

This research is qualitative-based, but uses quantitative approach methods. Data were obtained through questionnaires and then analyzed quantitatively by calculating percentages of questionnaire results that evaluated student responses to physics practicum involving parabolic motion experiments using tracker software.

This research was carried out at the Faculty of Teacher Training and Education, Physics Education Study Program at Campus 1 of the Indonesian Christian University of Toraja, located on Jalan Jenderal Sudirman Number 9, Bombongan Village, Mengkendek District, Tana Toraja Regency, South Sulawesi.

Data in this study came from a variety of sources, including:

1. The respondents of this study were students majoring in physics education UKI Toraja, and the data were collected through questionnaires.
2. Data are also obtained through direct observation at the location, especially in practicum observation.
3. Documents related to this study were also used as data sources.

In this study, data will be obtained through the use of several information collection tools, namely:

1. Questionnaire or questionnaire, which is the main instrument to evaluate student responses. The questionnaire is designed with questions built on the following indicators:
   a. Student interest in the use of tracker software.
   b. The level of ease in learning and using tracker software.
2. Observation, which allows researchers to describe the results of analysis about student behavior during physics practicum using tracker software. Observations focus on the following specs:
   a. Student interest in practicum activities
   b. The level of understanding of students in the use of tracker software.
3. Interviews with students, used to get students' views and opinions about the implementation of the practicum they participated in.
4. Documents, used to collect data derived from archives and documents relevant to this research.

The results of the study obtained from the questionnaire were analyzed using a descriptive statistical approach with a qualitative approach. Analysis of questionnaire data is carried out by applying formulas (Karuru et al., 2021):

$$p = \frac{f}{n} \times 100\%$$

Information:
p = percentage
f = frequency
n = number of samples

The percentage values obtained can be interpreted by referring to the parameters listed in table 1 (Helwig et al., n.d.).

Table 1. Parameters for the interpretation of percentage values

Percentage (%)	Parameter Description
0 – 39%	Strongly Disagree
40 – 55%	Disagree
56 – 75%	Agree
76 – 100%	Totally Agree

RESULTS AND DISCUSSION

After explaining the background of the research, the theories that support the research, as well as the research methods used, this chapter will discuss the results of the study. The results of the study were presented based on data obtained through questionnaires and observations. In the questionnaire given, there are 9 (nine) statements related to parabolic motion practicum using tracker software. The survey results of the nine statements are presented in table 2.

Table 2. Questionnaire Data Processing

Statement	STS		TS		S		SS	
	f	%	f	%	f	%	f	%
1	-	-	-	-	5	50%	**f**	**%**
2	-	-	-	-	8	80%	5	50%
3	-	-	2	20	8	80%	2	20%
4	-	-	3	30	5	50%	-	-
5	-	-	-	-	5	50%	2	20%
6	-	-	2	20	5	50%	5	50%
7	-	-	2	20	6	60%	3	30%
8	-	-	-	-	8	80%	2	20%
9	-	-	-	-	8	80%	2	20%
Total	-	-	9	90	42	580%	2	20%
Average	-	-		22,5	4,7	64,4%	19	23,0%

The explanation of these questions can be illustrated in the form of a diagram as follows.

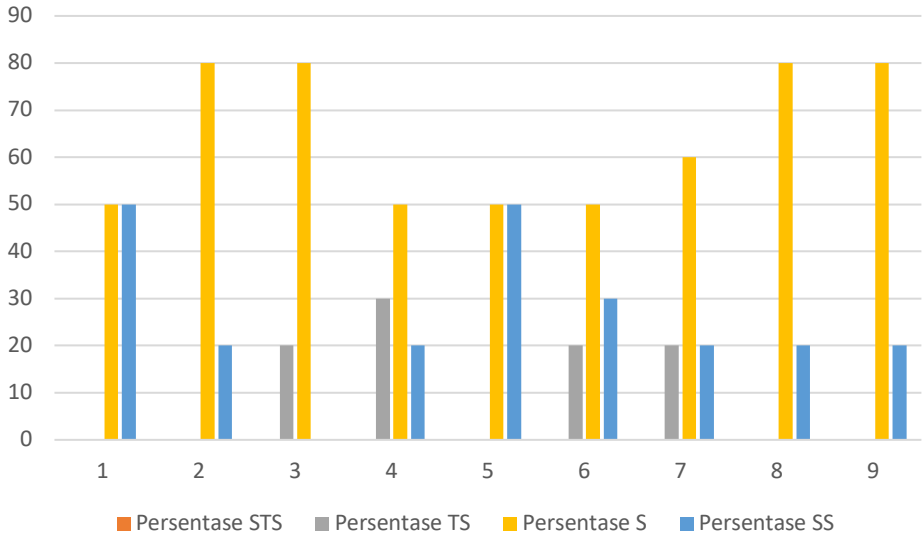

Diagram 1. The percentage of student responses to parabolic motion practicum using tracker software.

The questions in the diagram can be explained as follows.

Statement 1, namely that physics practicum using tracker software is interesting. Of the 10 respondents, half or 50% said they agreed, with the other half as well, or half expressed stronger approval that strongly agreed.

Statement 2, that stracker software is very helpful in analyzing parabolic motion experiment data. This statement received strong support from almost all respondents, around 80%, while a small percentage of about 20%, even strongly agreed with the statement. This belief arises because there are various variables of parabolic motion experiments that can be analyzed using tracker software.

Statement 3, the use of tracker software in practicum is very simple. Out of 10 respondents, almost all, about 80%, agreed with this statement. However, a small number of about 20%, disagree because they feel that adequate computer devices are needed and also because of the limitations of their use only in motion experiments.

Statement 4, in my view, the data generated from parabolic motion experiments using trackers has a high degree of precision. About half of them, about 50%, agreed with this opinion, in addition, about 20% of respondents, who are a small part, strongly agree, they argue that the level of accuracy depends on the angle of the video shot, and the quality of the object and the contrast with the background need to be maintained so that there are no errors in the analysis of objects.

Statement 5, parabolic motion experiments that utilize tracker software are considered simpler when compared to experiments that require the use of physical equipment. Of the 10 respondents, half or about 50% expressed approval, while the other half or 50% expressed stronger agreement, namely strongly agree.

Statement 6, the guide to using trackers is very easy to understand. Of the 10 respondents, about 50% expressed approval, while about 30% strongly agreed with the guidelines. On the other hand, about 20% of respondents expressed their disagreement on the grounds that the explanations in the guide used terms that were difficult to understand.

Statement 7, I am interested in deepening the knowledge of tracker software. The vast majority of respondents, about 60%, indicated approval of this interest, while a small part, about 20%, strongly supported it. On the other hand, about 20% of other respondents disagreed, arguing that the use of tracker software requires adequate devices to run it optimally and to achieve optimal results.

Statement 8, I feel satisfied when doing parabolic motion experiments with the help of tracker software. Out of 10 respondents, almost all, that is, about 80%, expressed approval, while about 20% strongly agreed with this opinion.

Statement 9, trackers improve understanding of the parabolic motion of an object. About 80% or almost all respondents expressed agreement with this statement, while about 20% or a small part of them even graphs, curves, and data are very informative.

From the explanation above, it can be seen how students respond to the use of tracker software in parabolic motion experiments. In statements 1, 7, and eight, it discusses the interest and enthusiasm of students towards the use of tracker software. Almost all responded with approval to all three statements. This indicates students' interest in using tracker software in physics practicum. However, the obstacle is the need for adequate computer equipment to maximize its use.

In statements 2, 3, and 6, it is discussed about the ease of use of tracker software. The majority of respondents agreed that the use of tracker software makes it easier for students to observe and analyze parabolic motion. The results of this observation show positive respondents and student interest in the use of tracker software. However, it should be noted that the analysis of data resulting from the use of tracker software is highly dependent on the quality of the video used, therefore, it is necessary to video with good quality and clear contrast between objects and background.

Student responses to physics practicums involving the use of tracker software in parabolic motion experiments achieved an approval rate of 64.4%. That way, it can be concluded that students respond to this physics practicum with a positive response or agree.

CONCLUSION

The use of tracker software in parabolic motion experiments makes it easier for students to observe and analyze parabolic motion. The use of tracker software in parabolic motion experiments is relatively simple and easy to understand. The results of student respondents to the physics practicum that integrated tracker software in parabolic motion experiments showed an approval rate of 64.4%. Therefore, it can be concluded that students give a positive response or agree to physics practicum that utilizes tracker software.

Based on the findings and conclusions that have been presented, the author would like to provide the following recommendations: 1. It is recommended that students who take the Physics Education Study Program be more in-depth in understanding and mastering the use of tracker software as a learning tool to understand motion phenomena. 2. It is important to integrate learning about various physics practicum software or devices in the curriculum to expand the knowledge and qualifications of prospective physics teachers. 3. This research can be used as a reference source for future research related to physics practicum tools, which can contribute to improving mastery of technology and information in the world of education.

REFERENCES

Gultom, E. S., Sitompul, A. F., & Rezeqi, S. (2021). Kecamatan Silinda Kabupaten Serdang Bedagai. Seminar Nasional Pengabdian Kepada Masyarakat, September, 462–467.

Helwig, N. E., Hong, S., & Hsiao-wecksler, E. T. (n.d.). No 主観的健康感を中心とした在宅高齢者における 健康関連指標に関する共分散構造分析Title.

Josephine, N. E. (2020). Modul Fisika Kelas X KD 3.4. Direktorat SMA, Direktorat Jenderal PAUD, DIKDAS Dan DIKMEN, 1–39.

Karanggulimu, L., Sudjito, D. N., & Noviandini, D. (2017). Desain Modul Praktikum Mandiri Tentang Gerak Parabola Menggunakan Simulasi PhET "Projectile Motion". Prosiding Seminar Nasional Pendidikan Sains, 212–214.

Karuru, P., Bundu, P., Anshari, A., & Gani, H. A. (2021). Students Perception on Physics Learning Interactions. Universal Journal of Educational Research, 9(5), 1044–1054. https://doi.org/10.13189/ujer.2021.090517

Klasifikasi Model Pembelajaran | Lembaga Pengembangan Pendidikan dan Penjaminan Mutu - Universitas Amikom Purwokerto. (n.d.).

Marliani, F., Wulandari, S., Fauziyah, M., & Nugraha, M. G. (2015). Penerapan Analisis Video Tracker dalam Pembelajaran Fisika SMA Untuk Menentukan Nilai Koefisien Viskositas Fluida Total Solar Eclipse View project Socio-Assessment View project. Prosiding Simposium Nasional Inovasi Dan Pembelajaran Sains 2015 (SNIPS 2015), 2015(June 2015), 333–336.

Pratiwi, R. R. (2016). Penerapan Metode Storytelling Untuk Meningkatkan Keterampilan Berbicara Siswa Kelas Ii Sdn S4 Bandung. Jurnal Pendidikan Guru Sekolah Dasar, 1(1), 199–207.

Raflesiana, V., Herlina, K., & Wahyudi, I. (2019). Pengaruh Penggunaan Tracker Pada Pembelajaran Gerak Harmonik Sederhana Berbasis Inkuiri Terbimbing Terhadap Keterampilan Interpretasi Grafik Siswa. Gravity : Jurnal Ilmiah Penelitian Dan Pembelajaran Fisika, 5(1), 1–12. https://doi.org/10.30870/gravity.v5i1.5207

Rahmawati, A., Supriatno, B., & Anggraeni, S. (2022). BIODIK: Jurnal Ilmiah Pendidikan Biologi Pengembangan Kegiatan Praktikum Fermentasi Alkohol dengan Menggunakan Gasometer Volumetrik Sederhana untuk Mengukur Laju Reaksi Fermentasinya (Improving of Alcohol Fermentation Practice Activities Using A Simple Volumetric Gasometer to Measure The Rate of The Fermentation Reaction). Jurnal Ilmiah Pendidikan Biologi, 08, 71–78.

Rajagukguk, J., & Sarumaha, C. S. (2019). Pemodelan Dan Analisis Gerak Parabola Dua Dimensi Dengan Menggunakan Aplikasi Gui Matlab. Jurnal Ikatan Alumni Fisika, 4(4), 1. https://doi.org/10.24114/jiaf.v4i4.11378

Rizki, I. A., Citra, N. F., Saphira, H. V., Setyarsih, W., & Putri, N. P. (2021). Eksperimen Dan Respon Mahasiswa Terhadap Praktikum Fisika Non-Laboratorium Menggunakan Aplikasi Tracker Video Analysis Untuk Percobaan Kinematika Gerak. Journal of Teaching and Learning Physics, 6(2), 77–89. https://doi.org/10.15575/jotalp.v6i2.12640

Santoso, D. M. D., & Winarti, W. (2019). Pengembangan Modul Fisika Materi Gerak Parabola Berbasis Generative Learning. Prosiding SNFA (Seminar Nasional Fisika Dan Aplikasinya), 4, 186. https://doi.org/10.20961/prosidingsnfa.v4i0.38508

Situmeang, B. S., Sudjito, D. N., & Wibowo, N. A. (2019). Desain Modul Pembelajaran Mandiri Tentang Gerak Parabola Pada Bidang Miring Tanpa Gesekan Udara. Radiasi : Jurnal Berkala Pendidikan Fisika, 12(1), 9–19. https://doi.org/10.37729/radiasi.v12i1.16

Syaepudin, M. R. (2018). Menganalisis Sudut Pendulum Pada Bidang Miring Menggunakan Software Tracker Video. Journal of Teaching and Learning Physics, 3(2), 14–20.

https://doi.org/10.15575/jotalp.v3i2.6553