



Supporting Media for Physics Practicum: The Process of Making and Using a Simple Ticker Timer

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ABSTRACT

Abstract: Writing this article aims to describe the process of making and using a simple ticker timer in physics practicum activities related to straight motion material. The ticker timer tool is included in one of the tools used in learning to make it easier for students to understand the straight motion material. The ticker timer tool developed is a modification of the ticket timer set using simple and easy-to-obtain materials. The process of making a ticket timer consists of three stages, namely 1). The preparation stage is in the form of tools, materials, and design of the tool model to be developed, 2). The manufacturing stage, and 3). The stage of use applied to measure the phenomenon of regular straight motion and regular change of straight motion. Based on the data obtained at the time of using the tool, it is known that the tool can work and be used to measure the time and speed of an object that is observed under certain conditions so that it can be used as a reference to the teacher in supporting the learning process in the classroom

Abstrak: Penulisan artikel ini bertujuan untuk mendeskripsikan proses pembuatan dan penggunaan alat ticker timer sederhana dalam kegiatan praktikum fisika yang berkaitan dengan materi gerak lurus. Ticker timer termasuk dalam salah satu alat yang digunakan dalam pembelajaran untuk memudahkan siswa dalam memahami materi gerak lurus. Alat ticker timer yang dikembangkan merupakan modifikasi dari ticker timer menggunakan bahan yang sederhana dan mudah didapatkan. Proses pembuatan ticker timer terdiri dari tiga tahapan, yaitu 1). Tahap persiapan berupa alat, bahan, dan desain model alat yang akan dikembangkan, 2). Tahap pembuatan, dan 3). Tahap penggunaan yang diterapkan untuk mengukur fenomena gerak lurus beraturan dan gerak lurus berubah beraturan. Berdasarkan data yang diperoleh pada saat menggunakan alat diketahui bahwa alat dapat bekerja dan digunakan untuk mengukur waktu dan kecepatan suatu benda yang diamati pada kondisi tertentu sehingga dapat dijadikan sebagai acuan kepada guru dalam mendukung proses pembelajaran di kelas.



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A. INTRODUCTION

Physical science is one of the main pillars of science and technology that provides an understanding of natural phenomena, which studies objects in nature, phenomena, natural events, and the interactions of objects in that nature. Physics is also a collection

of facts, concepts, laws / principles, formulas and theories that we must learn and understand (Rizaldi, et al., 2019). From the description above it shows that physics subjects have strategic and important value in preparing superior, reliable, and moral human resources from an early age. The obstacle so far in learning physics is due to the lack of packaging of physics learning with interesting, challenging, and fun learning methods (Rizaldi, et al., 2020a; Royani, et al., 2018; & Sundari, et al., 2017). In addition, students often think that learning physics is difficult, because the implementation of physics learning is currently experiencing many obstacles such as a lack of student interest in learning physics, teachers who are less professional, and inadequate learning tools so that it has an impact on the decline in learning outcomes of physics.

The problems above can be solved by increasing the ability of teachers in the learning process. One alternative is to carry out practicum activities (Rizaldi, et al., 2020b). Practicum is a form of student-centered learning and the teacher acts as a facilitator. In this form of learning, the teacher consciously places greater attention on involvement, initiative, and social interaction between students in a study group. The objectives to be achieved by placing students at the center of learning to include 1). Developing communication skills, 2). Developing a deep understanding of the physics concepts being studied, and 3). Develop skills in solving problems (Abdullah, 2017 & Festiawan, 2020). In addition to having a good impact in the learning process, the skills developed through the student-centered learning process provide opportunities for students to overcome various problems faced in real life according to the needs of the 21st century (Nurhayati, et al., 2020).

One of the teacher's problems in implementing practicum activities at the junior high school level is learning material about straight motion. For example, mechanics practicum on regular motion in straight line (RMSL) and Regular Changed motion in straight line (RCMSL) material, namely in determining the time of speed and acceleration, which is very rare for practicum (Firdaus, 2019 & Nastiti, 2019). This is due to the limitations of the tools in each school and the teacher's ability to operate the tools. As for the tools used in straight motion material, they are usually quite expensive, so it is very rare for schools to have them. Another thing that happened was that even though the school had sufficient funds to buy the tool sets, another obstacle arose, namely the lack of skills of the teachers in using the tools. These various limitations in the end make practicum unable to be carried out in a learning process. So the purpose of writing this article is to explain the manufacturing process and procedures for using a simple ticker timer to support the physics learning process in class, especially in straight motion material.

B. RESEARCH METHODS

Activities in the process of making and using a ticker timer tool as a supporting medium in physics practicum in junior high schools consist of several stages, namely as follows

a. Preparation Stage

1) Tools and Materials

The tools used include 1 unit of adapter / power supply, 1 unit of steel plate / nails / bolts that are sharpened, 1 unit of iron wrapped around a coil, 5 units of nuts, 10 units of bolts, 1 unit of screwdriver, 1 unit of solder, 1 unit of ruler, 1 unit of circuit board (20 cm x 9 cm x 1 cm), 1 unit of circuit board (7.5 cm x 9 cm x 1 cm), 1 unit of wooden planks as an inclined plane (75 cm x 23 cm), and 1 unit wooden block as a tool holder. While the materials used are 1 roll of typewriter, 6 sheets of carbon paper, 2 units of banana jacks, and 2 units of connecting cables.

2) Design Ticker Timer Tool



Figure 1. Simple Timer Ticker Tool a). Initial Design and b). Development Result

b. Making Stage

The steps in the process of creating a ticker timer include the following.

- 1) Prepare the tools and materials used in the manufacture of the ticker timer set.
- 2) Cut 1 piece of circuit board with a size of 20 cm x 9 cm x 1 cm, 1 piece of circuit board with a size of 7.5 cm x 9 cm x 1 cm.
- 3) Cuts wood as a stand with a size of 16.5 cm x 7.5 cm, 1 piece.
- 4) Cut the board as a track with a size of 75 cm x 23 cm as much as 1 piece.
- 5) Paint pieces of circuit boards, stands (blocks), and track boards.
- 6) Install all components in their respective places according to the design.
- 7) Connecting tools and materials using solder, glue, and bolts.
- 8) Connect the timer ticker with the adapter.
- 9) Checking whether all components have been installed correctly. If the needle moves and the typewriter runs consistent with the concept of regular straight motion and the straight motion changes regularly and all components have been installed correctly, the ticker timer can be used.

c. Usage Stage

A simple ticket timer tool is used to measure speed, time, and acceleration in straight motion theory at the junior high school level. The use of this tool utilizes the position of objects that are on an inclined plane (the level of the tilt angle is adjusted to the needs) by tying a ribbon to the object as an indicator of the object's velocity. The indicator is seen by looking at the black dot that appears when the ticket timer is turned on and the distance between the points and the time taken by the object can be seen.

C. RESULT AND DISCUSSION

1. Result

a. Regular Motion in Straight Line (RMSL)

Table 1. The Relationship Between Distance and Time

No.	Distance (cm)	Time (second)
1.	2.7	1.0
2.	5.5	2.0
3.	7.4	3.0
4.	10.5	4.0
5.	12.4	5.0

The value data obtained is then translated into a graph as in the following figure where the y-axis describes the amount of time while the x-axis describes the amount of distance.

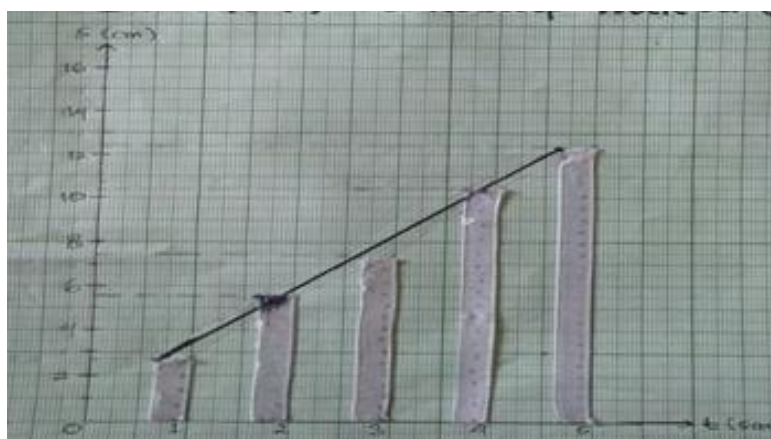


Figure 2. The Graph of the Relationship Between Distance and Time at Regular Motion in Straight Line (RMSL)

b. Regular Changed Motion in Straight Line (RCMSL)

Table 2. The Relationship Between Distance and Time

No.	Distance (cm)	Time (second)
1.	1.5	1.0
2.	3.9	2.0
3.	7.4	3.0
4.	15.0	4.0
5.	40.0	5.0

The value data obtained is then translated into a graph as in the following figure where the y-axis describes the amount of time while the x-axis describes the amount of distance.



Figure 3. The Graph of the Relationship Between Distance and Time at Regular Changed Motion in Straight Line (RCMSL)

2. Discussion

Regular Motion in Straight Line (RMSL) is the motion of objects with a straight trajectory and a constant speed. According to Newton's First Law of motion, an object can move in a straight order if there is no external force acting on the object (Kanginan, 2016; Serway & Jewett, 2010). This also means that if there is no resultant force acting on an object, then its acceleration is zero. This is what is characteristic of Regular Motion in Straight Line (RMSL), namely constant velocity and zero acceleration, while Regular Changed Motion in Straight Line (RCMSL) is the motion of objects in a straight line with constant acceleration. The purpose of this activity is to make a simple physics practicum tool that can be used as a learning medium to assist teachers in explaining the concepts contained in straight motion material, especially at the Junior High School level. The ticker timer tool that has been made is then used or tested on several titles of practicum activities that can be applied in the learning process. The titles of the practicum activities include 1). Regular Motion in Straight Line (RMSL) and 2). Regular Change Motion in Straight Line (RCMSL), where the title of the activity is arranged systematically according to the level of depth and breadth of the material.

The first activity in the practicum is to observe Regular Motion in Straight Line (RMSL) using a simple ticker timer. To make the ticker timer move in an orderly straight line, a wooden plank is used as a track by placing it horizontally without using a block as a support. The data collection activity by students was carried out fifteen times, in which twelve attempts were successful and three attempts failed. The next activity carried out by the students was related to the topic of Regular Change Motion in Straight Line (RCMSL) by placing a wooden board on one side as a support. The goal is for the toy car to move straight and change in order. This activity was carried out fifteen times like the first activity, where thirteen attempts were successful and two failed attempts. From the number of successful experiments, the best one tape for each time interval is taken as a sample for the five typed data.



Figure 4. The Process of Testing the work of a Simple Ticker Timer Tool with Students to Test the Concept of RMSL

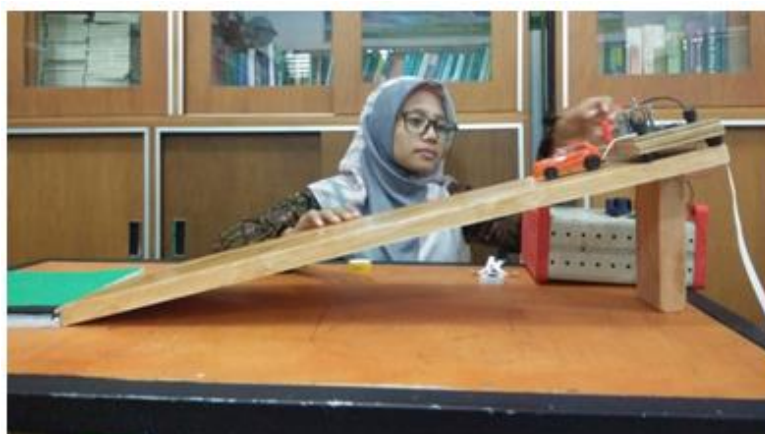


Figure 5. The Process of Testing the work of a Simple Ticker Timer Tool with Students to Test the Concept of RCMSL

The failure during the process of using/testing the practicum tool is caused by two factors, namely the typing timer that is not functioning properly and the toy car used has too high a speed. The existence of these two error factors causes no typing points to appear on the typewriter, even if typing points appear, the dots are not clearly visible on the typewriter. As a result, the two activities still produce typewriters with unclear typing points, and there are even parts on the typewriter where there are no typing points.

In order for the experiment to run smoothly, it is necessary to improve the timing of typing and to the toy car or object used, the speed of movement must be paid more attention to, because if you use a toy car or object that has non-constant speed, the typing on the ribbon will not be clearly visible. From the results of typing on one ribbon that is used as a sample for each activity, it can be concluded that the motion performed by the ticker timer is Regular Motion in Straight Line (RMSL) and Regular Change Motion in Straight Line (RCMSL). From each of these ribbons, you can then find the ticker timer speed by dividing the typewriter into chunks containing five types. For ribbons with five types, the speed is determined by dividing the distance by 5 types (as the distance traveled).

Based on the activities carried out, students are very enthusiastic to be included both during the tool making process to the data collection process (the trial phase). Learning that is carried out directly by students will be more meaningful because students can directly prove various concepts that students have learned (Rizaldi, et al., 2021a). There are at least four reasons about the importance of practical learning, including 1). Generating motivation to learn, so that students will be serious in learning something, 2). Developing various basic skills needed by students in solving problems starting from the stages of observing, questioning, gathering information, associating, and communicating, 3). Become a vehicle for learning a scientific approach, and 4). Supporting subject matter in class (Fatimah, et al., 2020; Rizaldi, et al., 2021b; & Suryaningsih, 2017).

D. CONCLUSION

Based on the explanation described in the previous section, several things can be concluded as follows.

- a. This ticker timer tool can be applied as a learning support medium at the Junior High School level for Integrated Science subjects with Straight Motion material.
- b. Practical activities that can use this ticker timer include Regular Motion in Straight Line (RMSL) and Regular Change Motion in Straight Line (RCMSL).
- c. Student-centered learning provides greater opportunities for students to test and develop abilities in students.

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