



## The Friction Force and Effects in Daily Life

Hande Gökdoğan<sup>1</sup>, Bülent Büyükkaydın<sup>2</sup>

<sup>1,2</sup>Terakki Foundation Sisli Terakki Private High School-Physics Department (Turkey)

<sup>1</sup>[HandeGokdogan@terakki.org.tr](mailto:HandeGokdogan@terakki.org.tr), <sup>2</sup>[BulentBuyukaydin@terakki.org.tr](mailto:BulentBuyukaydin@terakki.org.tr)

### Abstract

*There are many experiments carried out in laboratory to teach various subjects of physics. Since some subjects are difficult to be comprehended easily by students, teachers design various activities and experiments in both classroom and laboratories by taking into account the different learning styles and teaching strategies. The purpose of this study is to investigate the friction force thoroughly, discuss which factors effect the friction force and to understand the advantages, disadvantages and important applications in many engineering disciplines by doing various experiments. The experimental designs used in physics will help students to understand the cause and effect relationships better and it is an effective and enjoyable way of moving pupil from passive to active learners. There are four steps carried out in this study. In the first step, students investigated the results and effects of friction force exerted on the overlapping pages of two nested books located on their tables. In the second step, students study on a simulation and investigated the differences between static and kinetic friction force whose web address [1] is given at the bottom. Next step was about discussing the conquest of Istanbul by Sultan Mehmet the Conqueror and how he transported the fleet overland (on the road of greased logs) into Golden Horne due to the defensive chain the Byzantines had previously laid across the entrance. The aim of this step was to show the relationship between the type of the surface and the normal force. Finally, the last step was giving daily life examples about friction and discussing their effects. During the study all students were completely engaged with the activity as desired before. In the end, it was observed that students were more motivated and engaged at different steps better than others due to their skills and interests. This observation led us to the importance of recognizing and understanding students' learning styles. As a result, using and designing different techniques in each step that suited to them had accomplished the desired learning. At the end of the study, an assessment test is distributed to students and evaluated.*

### 1. Introduction

Students take in and process information in different ways. Being conscious of learning styles is a way to help improve student's quality to learn. Adapting methods to individuals will allow an individual to learn better. Teaching methods vary. They should lead students to self-discovery. Knowing the learning styles of students can help the teachers to use teaching methods that can maximize the learning potential of the students. Physics teachers especially need teaching methods because according to many students, physics is difficult. There are many investigations that state students believe physics is difficult. What can be done to overcome these difficulties? One of them [2] They found that students find physics difficult because they have to contend with different methodologies such as experiments, formulas and calculations, graphs, and conceptual explanations all at the same time. Moreover, they have to make transferences among them. For example, students need to be able to create connection from graphical representations to mathematical representations. Redish [3] explains why students describe physics as difficult: "Physics as a discipline requires learners to employ a variety of methods of understanding and to translate from one to the other such as words, tables of numbers, graphs, equations, diagrams, maps. Physics requires the ability to use algebra and geometry and to go from the specific to the general and back. This makes learning physics particularly difficult for many students (p.801)." There are many experiments carried out in laboratories to teach Classical Physics. Laboratories can help students to understand Newtonian Physics.

### 2. Material and method

The purpose of this study is to investigate the friction force thoroughly, discuss which factors can affect the friction force and to understand the advantages, disadvantages and important applications in many engineering disciplines by doing various experiments. This study was designed to demonstrate an effective and enjoyable way to make pupils more active learners and make them understand the topic. Before the activity, a paper was distributed to students. It had two sections that contained some questions to evaluate their pre-knowledge on this subject. In the first step, students investigated the



effects and results of friction force exerted on the overlapping pages of two nested books located on their tables. They felt the effect of the friction force by being unable to separate two nested books from each other. Then, we discussed its reasons. In the second step, students studied on a simulation whose web address [1] and investigated the differences between static and kinetic friction force. As a result of the shown of this simulation, we were able to catch students' attention and noticed that their comprehension increased remarkably. The students who are visual learners were made an active in this step of the study. Next step was about discussing the conquest of Istanbul by Sultan Mehmet the Conqueror and how he transported the fleet overland (on the road of greased logs) into Golden Horn due to the defensive chain the Byzantines had previously laid across the entrance. The aim of this step was to show the relationship between the type of the surface and the normal force. We discussed their observations with students. The students who are kinesthetic learners were made an active in this step of the study. Finally, the last step was giving daily life examples about friction and discussing their effects. At the end of the studies, the students were evaluated with a subject test.

### 3. Conclusion

Active participation was achieved for the different learning styles of students. Students at all stages discussed with each other about this study and thus a student-centered learning environment was achieved. Students became responsible for their own learning in each activity. During the performance of all activities, the students became more active on investigating different learning styles. During the discussion of the uncertainties in the minds of students the false and / or incomplete perceptions were seen. At the end of this study, the answers to their questions about the friction force were given. We observed that this type of approach captures students' interest, enhances student motivation and self-confidence. It also allows students to improve their independent learning skills and cooperative problem solving skills.

### 4. Results and discussion

To help the students in sampling the friction force we should supply them with appropriate educational tools, activities and demonstrations as well as the lectures. This kind of approach involves significant modifications in teaching methods by the teachers. Also it can increase the students' interest and activity level while developing their learning ability and skills. Similar applications can also be applied to other physics subjects. Today, taking into account the students' learning styles has become a necessity for teachers to organize student-centered activities.

### References

- [1] [http://www.animations.physics.unsw.edu.au/jw/weight\\_and\\_friction.htm](http://www.animations.physics.unsw.edu.au/jw/weight_and_friction.htm)
- [2] Ornek F., Robinson W., Haugan M. ( 2008) "What makes physics difficult?" International Journal of Environmental & Science Education, 2008, 3 (1), 30 – 34
- [3] Redish, E. F. (1994). "The implications of cognitive studies for teaching physics" American Journal of Physics, 62, 796-803