



Visualizing School Level Physics Principles using Computer Simulation



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Abstract

Visualizing the phenomena of Physics is crucial to a better understanding of the subject. Various constraints like lack of resources, inability to conduct demonstrations and experiments, etc., especially in the context of Nepal, have made it difficult for students to have a concrete view of Physics. So, this web-based application, based on the Science curriculum of class 10, was developed using HTML, CSS and JS, as a solution to better equip teachers and students all over Nepal with a better tool to explore various depths of complex topics in school level Physics. The curriculum was thoroughly analyzed and six topics were selected and simulated based on some criteria. In addition, a small-scale evaluation was conducted to get an overview of the efficacy of the application. Overall, the application, while compared to the traditional methods of teaching, was effective to some extent.
Keywords: simulation, phenomena, visualization, physics, laboratories.

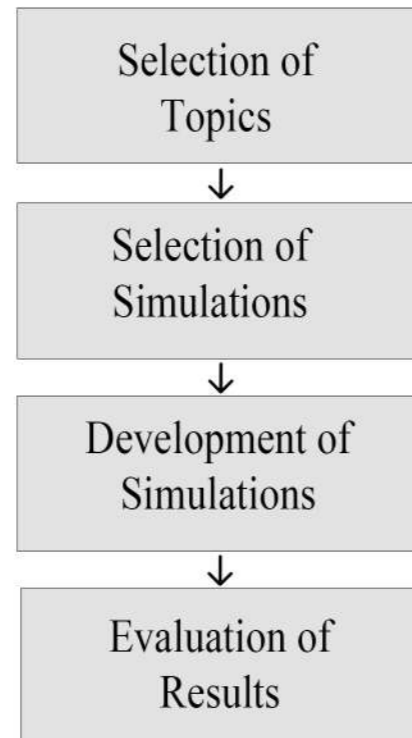
Introduction

1. Physics being abstract creates challenges in developing a coherent understanding among students.
2. Nepal lacks specialized laboratories and resources to conduct physical experiments.
3. Simulations available online aren't specific to the Science Curriculum of Nepal.
4. A web-based application was developed and evaluated.

Objectives

1. To develop visualization methods to facilitate the learning of physics principles in school level students.
2. To test the effectiveness and reception of the developed application by science students.

Methodology



Results and Discussion



Figure 1: Some simulations

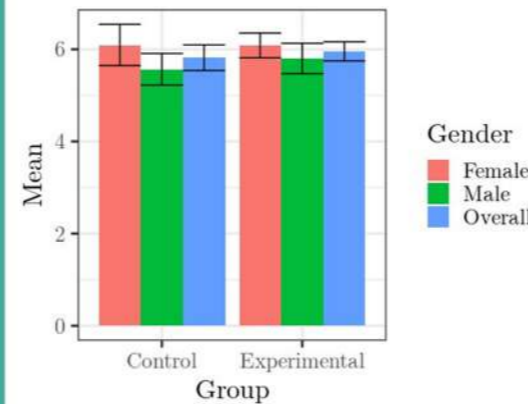


Figure 2: Mean Values of test scores

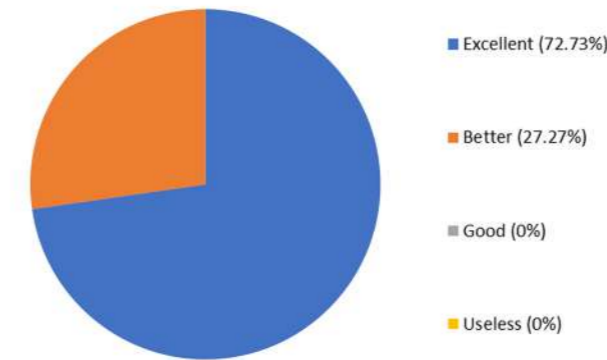


Figure 3: Response of students

Table 1: Analysis of the test scores

S.N.	Group	Gender	Mean	Standard Error	Overall Mean
1	Experimental	Male	5.8	0.329	5.95
		Female	6.08	0.269	
2	Control	Male	5.57	0.343	5.82
		Female	6.1	0.447	

The simulations are available online at: <https://www.visualscience.netlify.app>

Conclusion

1. This application can be beneficial in visualizing physical phenomena to both teachers and students.
2. The complex and abstract topics of physics can be taught with pictorial tools, accompanied with an increase in the attentiveness of students in a classroom.
3. This application, thus, can be a great method to visualize school level physics.

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