



# MY PROJECT AT ALL HALLOWS SECONDARY SCHOOL

PHYSICS IN EDUCATION

CRAIG COATES

- Introduce yourself and give a brief description of the school you attended.
- Outline how the presentation will describe the project performed at the school.
- Inform that the project was performed by the teacher while I assisted.
- The plan being for me to perform alone at a later stage, which did not happen due to the COVID-19 Lockdown.



## AIMS

- A) To teach students the basics of transverse and longitudinal waves using a practical demonstration
- B) Demonstrate the wave's characteristics using a ripple tank (wavelength, amplitude etc.)
- C) Allow students to learn through observing and calculating the relation between these characteristics for themselves

## HOW

- A) Slinky demonstration
- B) Ripple tank Wave Machine demonstration
- C) Worksheet on the ripple tank

## ANTICIPATED LEARNING OUTCOMES

- The ability to distinguish between longitudinal and transverse waves
- Be able to name wave characteristics
- Learn how these characteristics relate to each other



- Start by asking the question to the audience, 'What were the aims?', splitting them into the three main categories on the slide.
- Mention that these A, B, and C categories will be referred to later in the presentation.
- 'So how were these aims achieved', give very brief description of each category informing them that there will be more detail on each in further slides.
- Outline the anticipated learning outcomes for the students so the audience knows the purpose of the project.

## WHY THIS PROJECT?

- Wave characteristics and oscillations in waves are essential concepts in physics
- Students and teachers struggle with using the ripple tank to learn/teach these important concepts
- Perhaps a fresh and current physics student can help



- Explain this project was chosen because waves and their oscillations are important, an essential concept for physics students to understand.
- Explain why wave characteristics are essential to learn: So many things are made up of waves, sound, light, energy.
- Outline why/how students and teachers struggle with this project, the technical difficulty in reading the waves on the ripple tank.
- Giving firsthand accounts by the teachers on their experience with this ripple tank set up, hence a desire for fresh eyes on the problem from a current physics student.
- Briefly inform the experiment is on the curriculum and disliked by teachers for above reasons but unable to scrap, hence wanting help.
- Explaining how you could contribute and perhaps bring new ideas to the project.



## THE METHOD

### PART A

- A slinky was held on a table with students gathered. The teacher, Mrs Dickson and I moved it to demonstrate the below patterns/waves

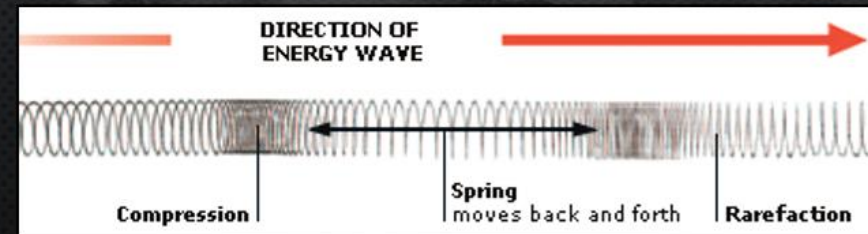
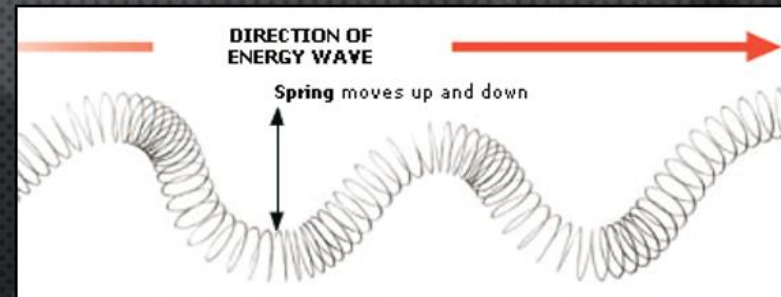
### TRANSVERSE WAVE

-Perpendicular movement of spring/wave to direction of energy

### LONGITUDINAL WAVE

-Parallel movement of spring/wave to direction of energy

## THE SLINKY DEMONSTRATION

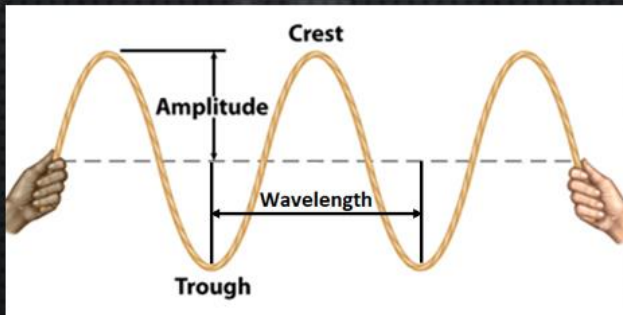


- Read the first paragraph, explain how Mrs Dickson and I used one slinky to demonstrate wave patterns to the students.
- Demonstrate that this is 'Part A' of the method is to achieve aim A from the first slide.
- Go over the two subtitles 'Transverse' and 'Longitudinal' and briefly describe what we told the students while making the waves.
- Tell the audience that the two main learning outcomes for the students here was the direction of the wave vs the direction of the energy.

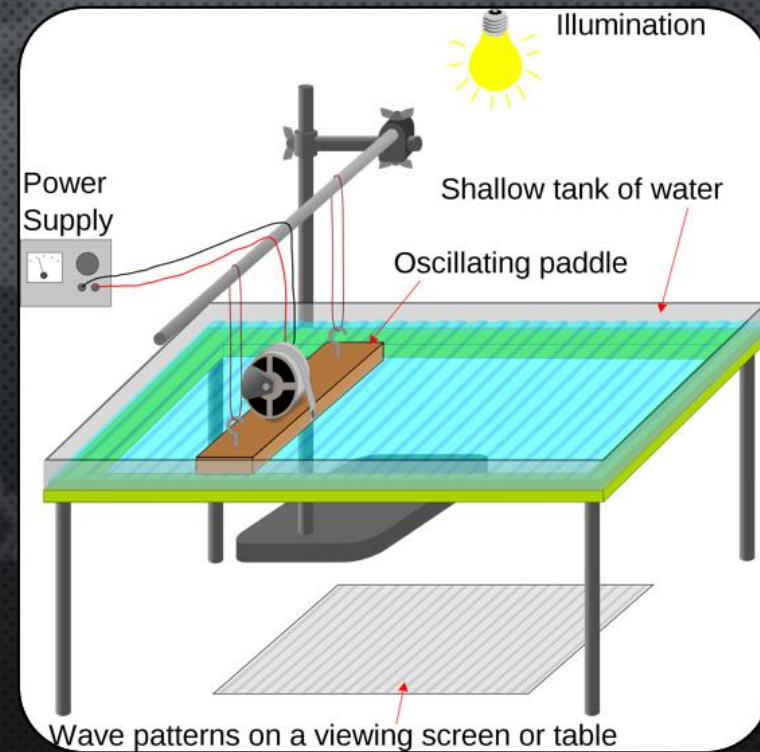
## THE METHOD

### PARTS B AND C

- A ripple tank was used to demonstrate the movement of waves
- The students observed the teacher measure the waves characteristics
- A worksheet was then used for students to work through



## THE RIPPLE-TANK DEMONSTRATION



- Point out this 'Part B and C' of the method was to achieve aims B and C in the first slide.
- Briefly explaining what a ripple tank is and how it works using the picture supplied (On the right).
- Show how this demonstration fulfils aim B showing the students the waves and naming and explaining their characteristics.
- Explain that the bottom left picture is an example of a part of the worksheet the students had to fill out following these demonstrations.
- This last part was to fulfil part C, testing the student's comprehension from parts A and B.



## THE STUDENTS RESPONSES

### PART A- SLINKY DEMONSTRATION

- Positive response with evident understanding of the motions of waves vs the flow of energy
- No evidence or obvious sign that the connection was made from analogy to reality



### PARTS B AND C- RIPPLE-TANK

- The students seemed disinterested during the demonstration
- Observations were made and worksheets correctly completed, but no follow up questions



- Propose the question to the audience, 'What were the student's responses to this project?'.
- Answer in parts, first explain how the students enjoyed and responded positively to part A of the demonstration.
- However, this part of the demonstration did not show us if they understood the connection between the slinky and actual waves, for example in the electromagnetic spectrum etc.
- Explain how in part B the students did not seem attentive. Explain why you thought this was the case. Perhaps the demonstration was not as entertaining as the previous demonstration or perhaps the students were confused by part B's technicalities.
- Conclude that in part C (the worksheet) it was shown that students did learn the basics, despite the lack of interest, proving their comprehension.



## PROJECT'S USEFULNESS

- The project was useful in demonstrating to the students the differences between Longitudinal and Transverse waves
- Its usefulness in demonstrating real wave patterns is unclear as there was no test for students to show comprehension
- Great for demonstrating the measuring of the waves and its characteristics, shown in the worksheet.



- Was the project useful? Yes, it was, here is why.
- How well the students understood the oscillations (Part A) of the demonstration and how this is important for further study in all realms of physics.
- Part B did demonstrate real waves, however the worksheet failed to incorporate a test to gauge the students' real understanding of this.
- Explain how the worksheet (Part C) was very useful to test comprehension and show the students had the correct understanding.

## FUTURE IMPROVEMENTS

- Ripple tank for small groups of students
- Time for students to interact with the waves themselves
- Longer and repeating worksheet to confirm appreciation as well as understanding

## CONCLUSION

- Overall successful project showing students the basic concepts of waves
- Allowing the students to observe waves and their patterns in real life demonstration



- Suggest to the audience if there were to be improvements the first would be a ripple tank for teams of students to allow them to interact personally with waves.
- Give the students more time to play around with the waves, so they can observe what happens, e.g. when one increases the wave power etc.
- On top of the above improvements the worksheet could be longer by repeating questions in different ways, to fully test their comprehension and appreciation of the concepts learned.
- Conclude the presentation by saying overall the project was a success and taught the students the essential concepts of waves and their oscillations.
- The project allowed them to see firsthand waves in action while learning their characteristics, a very useful observation in physics.



# THANK YOU TO ALL HALLOWS

## AND THEIR AMAZING STAFF AND STUDENTS

### QUESTIONS ?

ALL BACKGROUND PICTURES USED SOURCED FROM <[HTTPS://WWW.ALLHALLOWS.NET/](https://www.allhallows.net/)>  
ALL FOREGROUND PICTURES USED ARE SOURCED IN BIBLIOGRAPHY



**All Hallows**  
Catholic High School  
*'Growing Together in the Spirit of Christ's Love'*



- Thank the audience for their time and attention and politely invite them to ask any questions they have on the presentation of my project.