

Promoting Physics Understanding through the use of Creative and Teacher-Led Continuous Professional Development (CPD)

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Overview

- ▶ Rationale and Background
 - ▶ Project Aims
 - Aims for Year 2
 - ▶ Timeline – Year 2 Cycle 2
 - ▶ IBL Tasks
 - ▶ Observations
 - ▶ Implications for Teaching
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Motivation for the Research

- ▶ PhD research study (Broggy & McClelland, 2010)
 - Undergraduate physics students
 - Problem solving ability (Walsh, Howard & Bowe, 2007)
- ▶ New Junior Certificate Science Syllabus (2003)
 - “manipulate information, carry out procedures, communicate findings, draw conclusions” (DES, 2003)
 - Problem solving – Coursework B (Scientific Investigations)
 - Higgins (2009)

The students do not understand the language in the booklet

Teachers give considerable help to students

Coursework B is eating into revision time

Students need a lot of help

Rational for Project

Team work can cause problems

I'm afraid I am doing it wrong

Lack of resources

How do I get the students attention after they go off and do investigations?

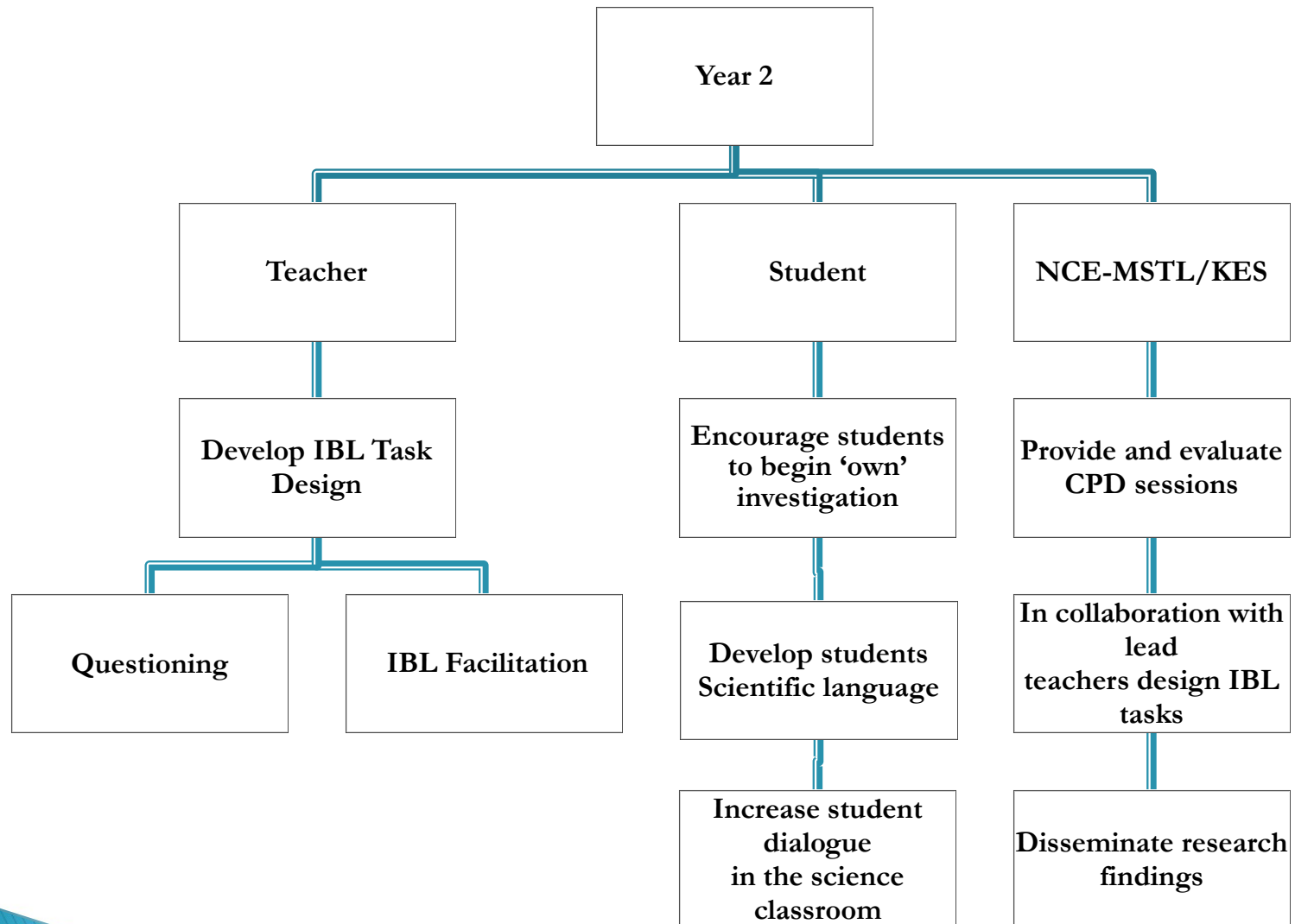
Research Context

- ▶ Unique partnership with KES
 - 8 schools in Kerry Education Service (KES)
- ▶ Lead Teachers
 - A lead teacher is a Junior Certificate science teacher that is involved actively in the data collection of this research project. He/She will be required to carry out several tasks including attending CPD training, implement IBL in their science classrooms, reflect on their experience and participate in teacher interviews amongst others.
- ▶ 5 CPD's Annually
 - IBL, questioning, scientific language
 - Year 2 – Within Croagh Park Hours
- ▶ Classroom Observations

Project Aims

- ▶ To develop the students' investigative skills through **inquiry based lessons**
 - ▶ To provide **Continual Professional Development (CPD)** training to teachers
 - ▶ To develop a valuable **teaching resource** incorporating a number of investigative approaches that can be used by both the teacher and students when carrying out scientific investigations.
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Aims for Year 2



Year 2 Cycle 2

IBL Task Design

Current Electricity



Timeline Cycle 2 Year 2

CPD 1

- Discussion of Electricity topic, learning outcomes and length of time it will take to teach the topic
- Planning of IBL Tasks

CPD 2

- Planning of IBL Tasks
- Ensure all teachers are confident in IBL facilitation and effective questioning to develop the topic

Following CPD 2

- Administration of diagnostic instrument to students both pre and post topic.
- Teaching of Electricity topic using IBL Tasks
- Classroom Observations

CPD 3

- Reflection of IBL tasks
- Discussion of Year 2 and planning for year 3

Developing a IBL Task

“inquiry tasks facilitate exploration and investigation of issues or scenarios that are open-ended enough for different responses and solutions to be possible”

(Khan and O'Rourke, 2005).

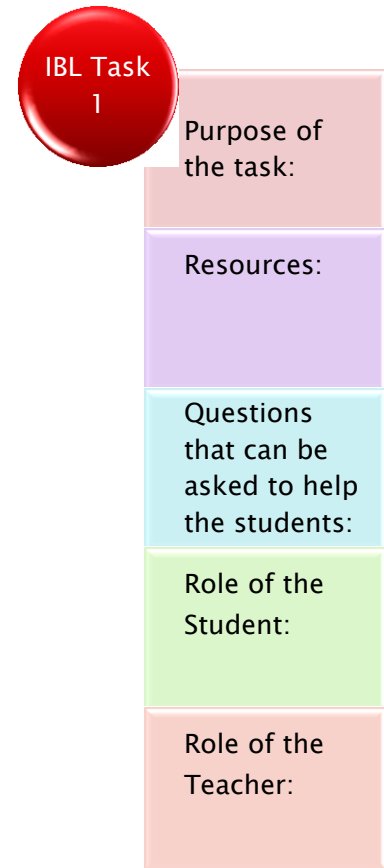


Development of IBL Tasks

- ▶ During CPD and at home
 - ▶ Focus on teacher ownership of task design
 - ▶ 7 essential elements of IBL
 - Plan learning outcomes
 - Identify student misconceptions
 - Identify students' prior knowledge
 - Activity/Activities
 - Discussion(s)
 - Practical Applications relating to concepts/concrete experiences
 - Concluding task
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IBL Tasks

- ▶ Task (From the 7 Elements)
- ▶ Purpose of Task;
- ▶ Resources
- ▶ Questions asked throughout the task to help the students?
- ▶ Role of the Student (give details)
- ▶ Role of the Teacher (give details)



IBL Tasks Continued

Task	Purpose	Resources	Questions that can be asked throughout the task to help the students?	Role of Student	Role of Teacher
Activity	Identify circuit symbols Followed by assembly of circuits	Pictures of symbols laminated or drawn on the board. Specific circuit components including wires, crocodile clips, bulbs, buzzers, switches and batteries	Identify the following the symbols Draw the symbol for the following components. Using the components that you have in your tray set up the circuit to ensure the bulb lights.	Students work cooperatively in groups to complete the worksheet where they are asked to identify the individual components of the circuits and then assemble them correctly	Have pictures of the components and symbols ready. Group the required circuit components and have them prepared for assembly activity. Guide the students asking probing questions
Place Mat Activity	To check prior knowledge	Place mat with guiding question “What does the word electricity mean to you?”	Where have you come across electricity in your daily lives? What do we need electricity for? What generates electricity?	Pupils work individually at the start then they share their ideas in groups of 4 and then report back to the class.	Guide them in their thinking, probe and encourage involvement from all group members. Devise a ‘key words’ list
Discussion	Linking resistance to ‘blocking’ in sports or in water flow in tubes.	Video of a rugby game and one team blocking another	What is happening in this video? What can you see? Why is it happening?	Discuss in groups of 2,	Present the clip, encourage collaborative and peer learning discussion, keep students on task, collect and present feedback

Classroom Observations

- ▶ One lesson observed
 - ▶ Carried out to inform the planning of upcoming CPD sessions
 - ▶ Provided a wealth of information
 - ▶ IBL tasks allowed for more flexibility
 - ▶ Teachers more confident in IBL, questioning and group work facilitation
 - ▶ Insight into planning vs. practice
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Teacher's Comments

– What is your understanding of IBL?

- ▶ *“Active learning, students are active in their own learning, they are able to design their own experiments, come up with their own ideas, make predictions”*
 - ▶ *“students have an input into whatever topic you are teaching, and that you would try to get as much knowledge out of the students, with maybe like a hook or something that would catch their attention and try and link it to everyday and that the students would be the one, with guidance ,would come up with the way of doing a certain experiment”*
 - ▶ *“Learning through the use of questioning, through the use of experimentation and worksheets”*
 - ▶ *“Not to spoon feed the kids, not to tell them what's what, just throw it out there and they have to investigate it themselves and we guide them in their learning”*
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Teachers Comments

– IBL Task Design

- ▶ Please comment on **your preparation** for the IBL Task design.
 - “I did have to put a lot of preparation into electricity because it was something I avoided for a long time, I found a lot of equipment and made up little bags of resources and worksheets that I can use again”
 - “I found it more challenging, I find what’s on the syllabus is so shallow, I had to just be confident on my own teaching of it and do a lot of background reading so I can be confident for the A1 student in front of you who asks why, why, why even though it’s not on the syllabus and I did a lot of work on educating myself a lot on the topic”

Teachers Comments

– IBL Task Design

- ▶ Did you feel it was beneficial working with a group to plan the science IBL tasks? Were there any challenges?
 - “meeting teachers allows us to pick up new ways to do it”
 - “challenges within the curriculum, every school has their curriculum set out for their year so trying to follow the school curriculum and the topics put in place was difficult”
 - “there were no challenging, It was good to hear what other teachers had to say”
 - “it was physics topics and that’s my field so if it was a chemistry topic it would have being easier for a chemistry teacher come up with the ideas”

Plans for Yr 3

- ▶ Focus on Coursework B
- ▶ Helping teachers plan and facilitate students
- ▶ Questioning
 - Trigger Questions
 - Probing Questions
- ▶ Teacher as a facilitator
- ▶ Student Data
 - Attitudes
 - Scientific Language
 - Conceptual Gain

Acknowledgements

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