

WRIPA & SEPnet Joint Workshop  
10<sup>th</sup> June 2024

# Exploiting Discipline-Based Education Research and its impact on student engagement

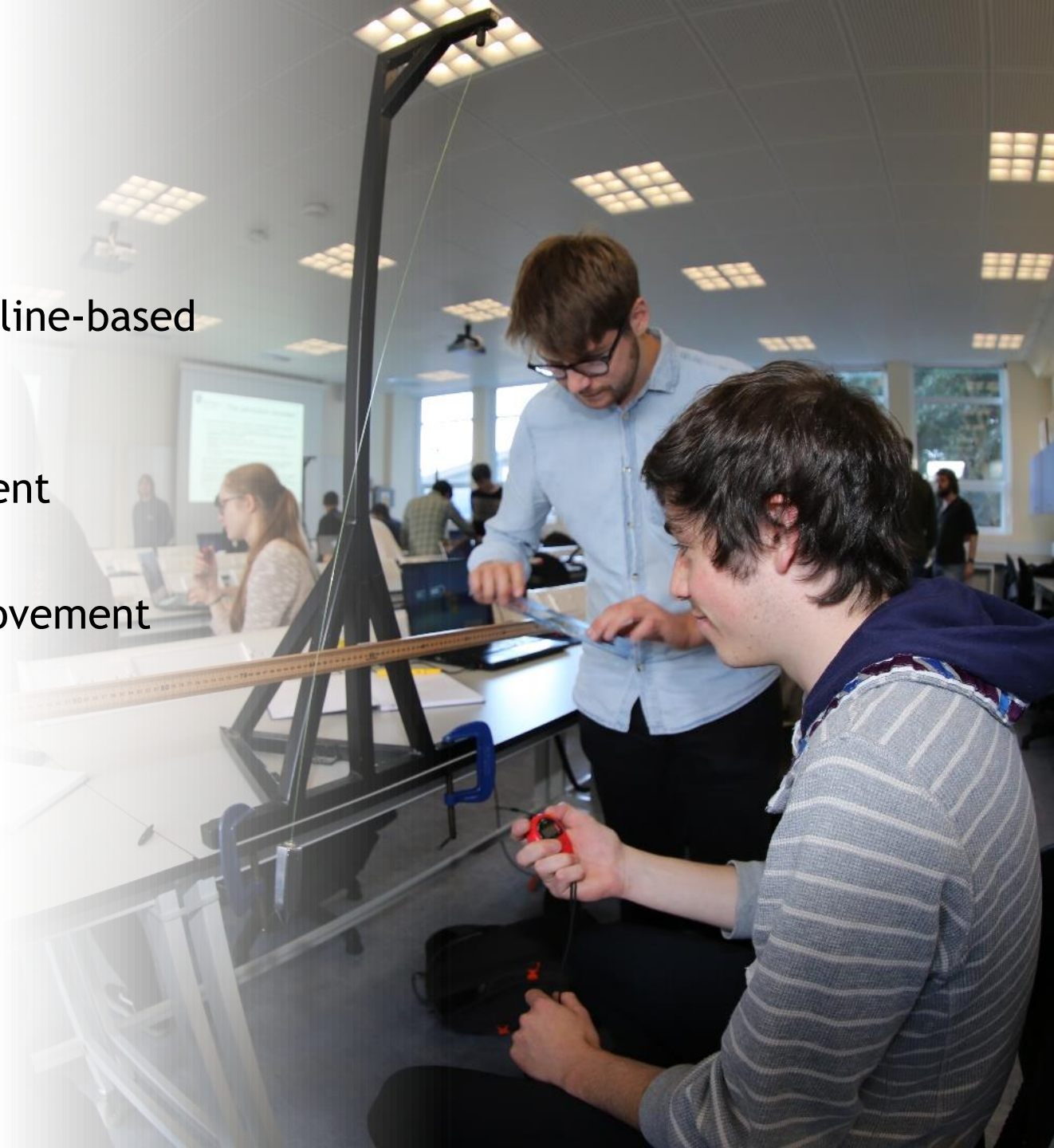


Oto-obong Inyang  
Department of Physics  
[www.durham.ac.uk/physics](http://www.durham.ac.uk/physics)  
o.o.a.inyang@durham.ac.uk



# Overview

- ❑ Motivation- Discipline-based education research
- ❑ Student Engagement
- ❑ Approach of improvement
- ❑ Case study
- ❑ Conclusion

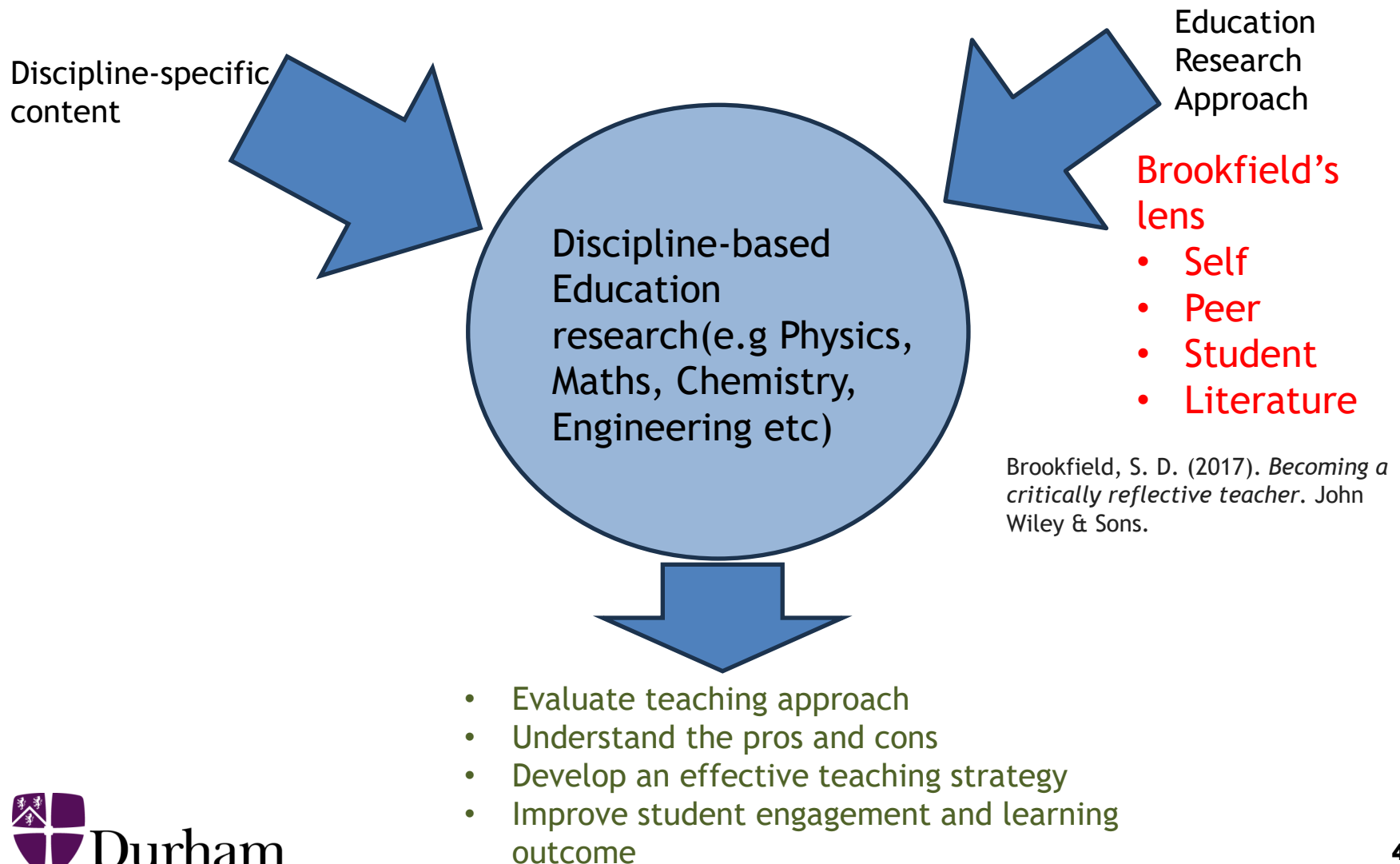


## “Quote”

“... universities should treat learning **(and teaching)** always consisting of not yet wholly solved problems and hence always in research mode.” (Humboldt, 1810 translated 1970, quoted by Elton, 2005, 110)



# Discipline-based education research





# Student engagement

Engaged student demonstrates:

1. Interest
  2. Motivation
  3. Attention
- Student engagement: Involving students in their learning.
  - Belonging and learning

High  
engagement



Improve  
academic  
performance

Kuzminykh, I., Ghita, B., & Xiao, H. (2021, August). The relationship between student engagement and academic performance in online education. In *2021 5th International Conference on E-Society, E-Education and E-Technology* (pp. 97-101).



# Approach to improve student engagement

Technology and  
simulators

Active learning  
techniques

- Enquiry-based learning
- Peer-led learning

Development of  
interactive  
activities

Continuous  
Assessment

Feedback  
mechanism

# Technology/Digital tools



Technology/Digital tools Ateş, H., & Köroğlu, M. (2024). Online collaborative tools for science education: Boosting learning outcomes, motivation, and engagement. *Journal of Computer Assisted Learning*.

Nielsen, W. (2015). Promoting engagement in science education. In *Student-generated digital media in science education* (pp. 4-12). Routledge.

Bond, M., Buntins, K., Bedenlier, S., Zawacki-Richter, O., & Kerres, M. (2020). Mapping research in student engagement and educational technology in higher education: A systematic evidence map. *International journal of educational technology in higher education*, 17, 1-30.

# Active learning techniques

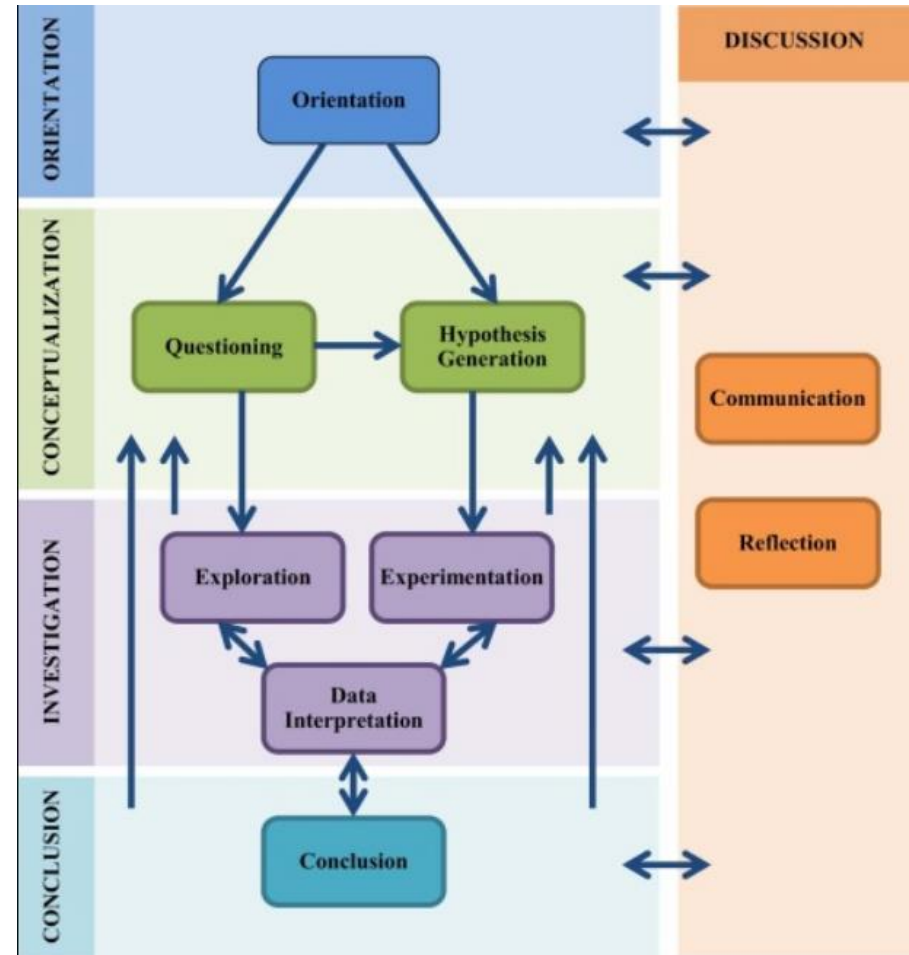
- Enquiry-based learning
- Peer-led learning

Pedaste, M., Mäeots, M., Siiman, L. A., De Jong, T., Van Riesen, S. A., Kamp, E. T., ... & Tsourlidaki, E. (2015). Phases of inquiry-based learning: Definitions and the inquiry cycle. *Educational research review*, 14, 47-61.

Sachs, J., & Parsell, M. (2013). In *Peer review of learning and teaching in higher education: International perspectives* (pp. 1-9). Dordrecht: Springer Netherlands

R. Dalka and T. McKay, PERC 2019 Proceedings, 123-128.

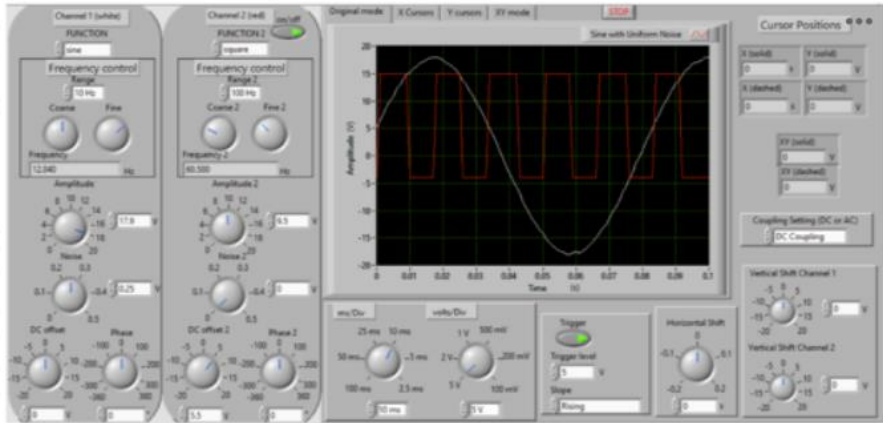
## Enquiry-based learning



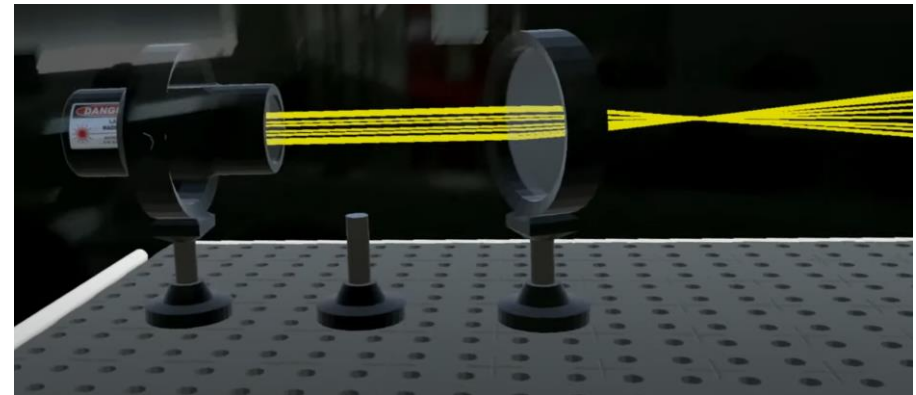


# Interactive tools/activities

## Virtual Oscilloscope-Prelab task



## Virtual optical table



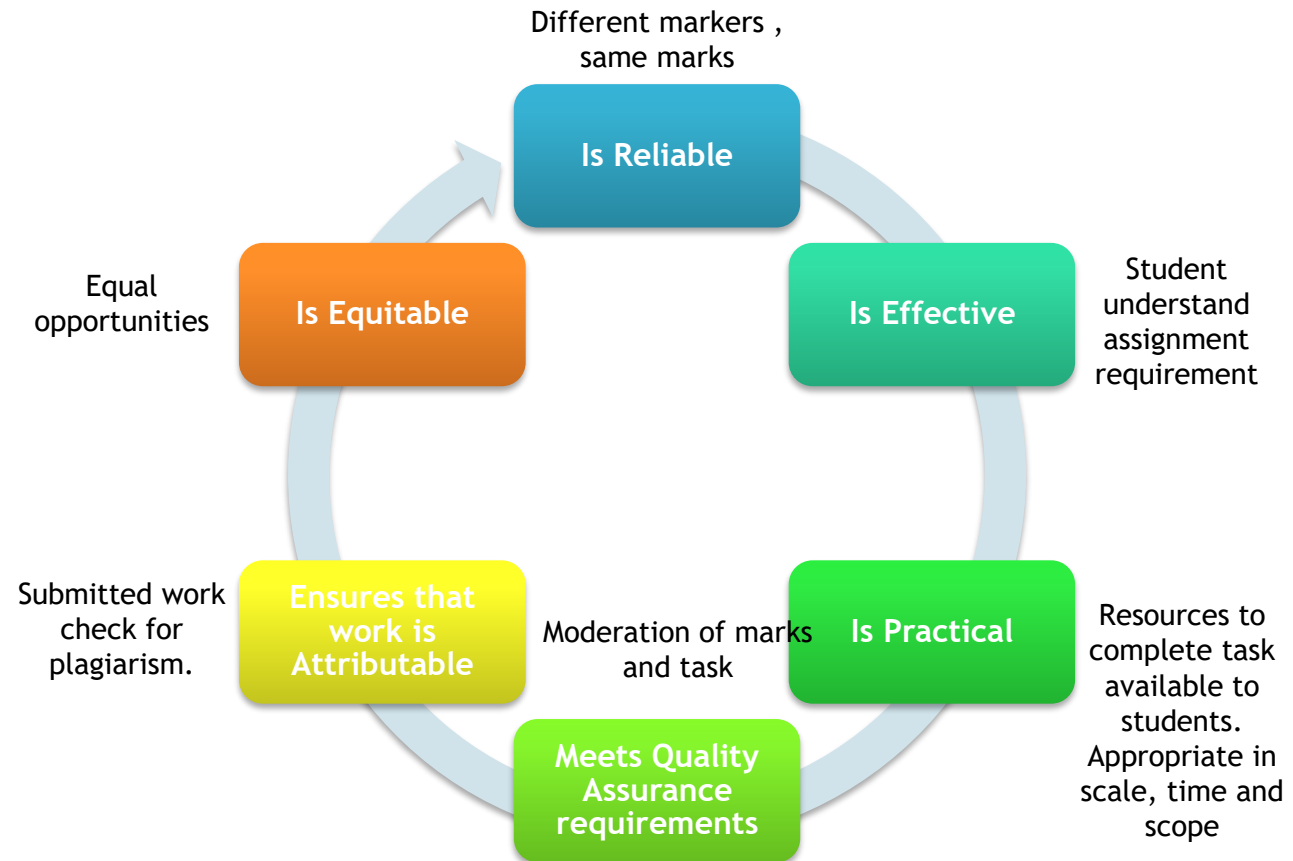
Nolan, S. J., Rees, S., & Rushall, C. (2016). Breaking Barriers: Overcoming Anxieties in Practical Science. *Widening Participation, Higher Education and Non-Traditional Students: Supporting Transitions through Foundation Programmes*, 73-88.

Dhar, P., Rocks, T., Samarasinghe, R. M., Stephenson, G., & Smith, C. (2021). Augmented reality in medical education: students' experiences and learning outcomes. In *Medical Education Online* (Vol. 26, Issue 1). Taylor and Francis Ltd.

Schneider, B., & Radu, I. (2022). *Augmented Reality in the Learning Sciences*.



# Assessment and feedback



Bloxham, S., and Boyd, P. (2007) *Developing effective assessment in higher education: a practical guide*. Maidenhead: Open University Press.

McDowell, L. (2012) *Handout used in PGCert in Higher Education Practice*, Northumbria University

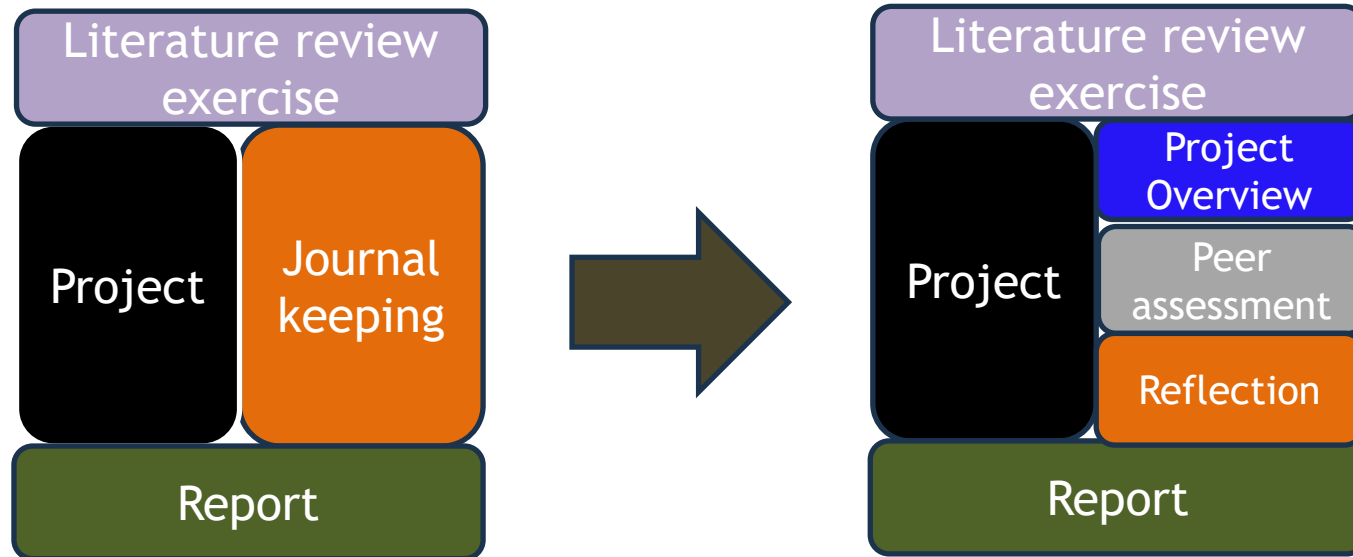
QAA (Quality Assurance Agency) (2012) *Understanding assessment: its role in safeguarding academic standards and quality in higher education: a guide for early careers staff*. Second edition. [https://dera.ioe.ac.uk/id/eprint/12286/7/UnderstandingAssessment\\_Redacted.pdf](https://dera.ioe.ac.uk/id/eprint/12286/7/UnderstandingAssessment_Redacted.pdf) [last accessed on 08June,2024]

# Case study: Lab project

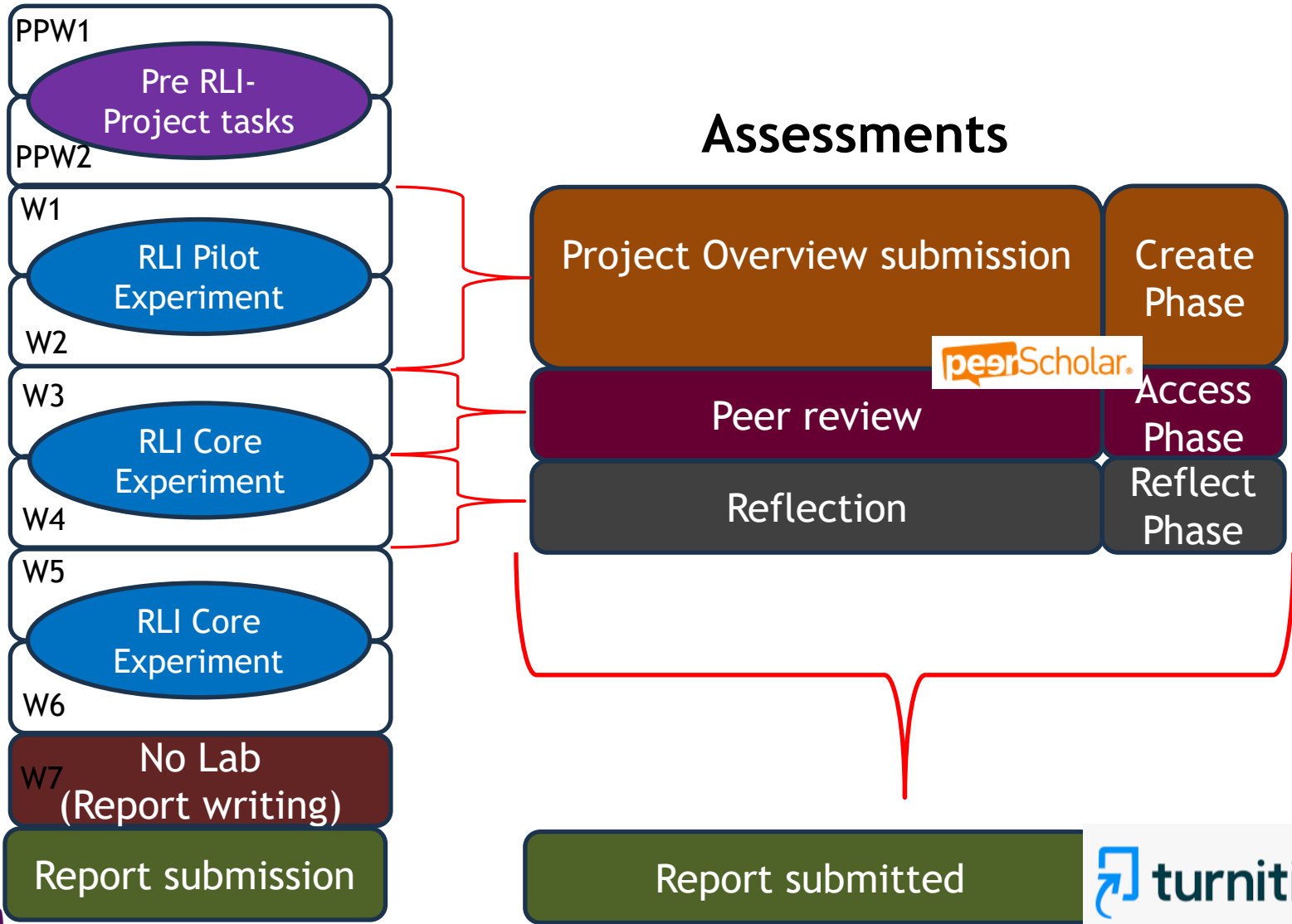
## Module section information:

- Open-ended project
- 12 projects available
- Contributes to 32% of total module mark
- 6 weeks project period -3 hours per week

## Model of delivery



# Schedule of Activities



# Project Overview- PeerScholar

https://eu.peerscholar.com/Course/1652/Activity/9567/Dashboard

peerScholar. Oto-Obong

My Sandpit Course (xrc286)

## Project Overview

My Sandpit Course (xrc286)

OVERVIEW STUDENT PROGRESS & GRADING ANALYTICS

Show Activity

### Case Study Activity

Provide an overview of your project with the following contents:

Literature review

Initial data analysis and plans for further work

Preview Delete Edit Data

Show Grades Edit Grading

6/11

Students Graded (54.55%)

Grade Now

10 Cases 3 Assessments ON Self-Assessment OFF Revision OFF Assess Feedback 0 Additional Questions

### Activity Completion

Create Assess Reflect

54.55% 54.55% 18.18%

### Activity Schedule

Edit Dates

1 Create Phase	2 Assess Phase	3 Reflect Phase
Status Completed Ended Aug 23rd 2023, 5:00pm	Status Completed Ended Aug 25th 2023, 2:00pm	Status Completed Ended Aug 29th 2023, 11:59pm



# Project Overview- Marking

<https://eu.peerscholar.com/Activity/9567/Evaluate>

**Feedback Received**

**Positive feedback** can have a strong and positive impact. Please highlight something specific you liked in your peer's work. Let them know what was done really well and why they might want to continue doing that in their future work.

I can see some text, '0.01 poise or 10-3 Pa. s (Pascal seconds),' highlighted - is this to avoid repetitive feedback on the same elements?  
25 Words

Now it's time to give **constructive feedback**. If your peer was going to change just one thing about their work, what change would improve it the most? And what are some ways they might go about making that change? Please remember everything you have learned about giving constructive feedback when you write this, and try your best to deliver your suggestions in a helpful tone that will minimize the triggering of a fight/flight reflex.

Figure attachment looks good too.  
5 Words

Mark the assessment using the rubric

	60-100	40-59	0-39
Demonstrated engagement with relevant theory and literature whilst planning and conducting the experiment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Original Composition**  
Words: 55

he viscosity of water at a temperature of 20 degrees Celsius is approximately 0.01 poise or 10<sup>-3</sup> Pa. s (Pascal seconds). Viscosity is a measure of the resistance of a fluid to deformation at a given rate. For liquids such as water, viscosity can be perceived as a measure of the liquid's resistance to flow.

**Attached Files**

Fig5.png Fig5.png

**Grading**

Qualitative Feedback

Comment (5 Words)  
Good , proofread before submission

Mark based on the assessment criteria below:  
Literature review  
Initial pilot experiment data analysis

	0-39	40-59	60-100
Demonstrated engagement with relevant theory and literature whilst planning and conducting the experiment	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Acquisition and timely analysis of pilot data	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Plans for full experiment and analysis, including feasibility and extent of analysis	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>

0/0 A+ 0/5  
77.78/100 (77.78%)  
(77.78%) Sep 15th 2023, 4:16pm

Save

# Statistics

## Previous model:

- Over 67% of the students added to the journal in the last week of the project (i.e. 33% engaged as expected).

## New model

- Create Phase - 99%
- Assess Phase- 89%
- Reflect Phase- 59%

## Merit:

- ❖ Better understanding of the proforma
- ❖ Draft of Report introduction
- ❖ Timely feedback to improve work

Demerit: No reward for participating in the reflect phase

# Students' comments

## Good Opportunities

".....was grateful to be able to use a telescope as part of the work".

## Careers

"...was a great way to explore a topic in-depth and experience the kind of thing a scientist would be doing day to day"

## Exemplars

"The project overview for the research project had no examples given".

Common themes in students' comments

## Independence

"was a good opportunity to practise independent research and experimentation"

## Skills acquisition

"the variety of the skills taught during the module is great - really allowed for personal exploration and growth"

## Time constraint

"due to the highly limited timeframe far more guidance is needed to ensure a practical that is feasible is completed in the time frame."

# Conclusion

- DBER has positive implications in today's Physics classrooms and laboratories.
- The application of a suitable approach to teaching and learning can significantly improve Student Engagement
- Teaching and learning are still in research mode! Hence the research continues 😊

THANK YOU

# Questions/Discussion and Food for Thought

## Questions for discussion:

- 1) What active learning strategies have you used to improve student engagement in
  - a. Lab-based module
  - b. Teaching module
- 2) In your department/School how have you utilised feedback and continuous assessment as effective tools to enhance student engagement?
- 3) What factors do you consider, when selecting a tool to enhance student engagement?
- 4) What are the indicators of improved student engagement?

