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

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Overview

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

- Discipline-specific content
- Education Research Approach
  - Brookfield’s lens
    - Self
    - Peer
    - Student
    - Literature

- Discipline-based Education research (e.g., Physics, Maths, Chemistry, Engineering etc)

- Evaluate teaching approach
- Understand the pros and cons
- Develop an effective teaching strategy
- Improve student engagement and learning outcome

Student engagement

Engaged student demonstrates:
1. Interest
2. Motivation
3. Attention

• Student engagement: Involving students in their learning.
• Belonging and learning

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


Active learning techniques

- Enquiry-based learning
- Peer-led learning


Interactive tools/activities

Virtual Oscilloscope-Prelab task

Virtual optical table


Assessment and feedback

- Is Reliable
  - Ensures that work is Attributable
  - Meets Quality Assurance requirements

- Is Equitable
  - Equal opportunities
  - Submitted work check for plagiarism.

- Is Effective
  - Moderation of marks and task
  - Student understand assignment requirement

- Is Practical
  - Resources to complete task available to students.
  - Appropriate in scale, time and scope


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

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

Assessments

Project Overview submission

Create Phase

Peer review

Access Phase

Reflection

Reflect Phase

Report submitted
Project Overview - PeerScholar

Project Overview
My Sandpit Course (xrc286)

Case Study Activity
Provide an overview of your project with the following contents:
- Literature review
- Initial data analysis and plans for further work

Activity Completion
- Create: 54.55%
- Assess: 54.55%
- Reflect: 18.18%

Activity Schedule
1. Create Phase
   Status: Completed
   Ended Aug 23rd 2023, 5:00pm
2. Assess Phase
   Status: Completed
   Ended Aug 25th 2023, 2:00pm
3. Reflect Phase
   Status: Completed
   Ended Aug 29th 2023, 11:09pm

Students Graded (54.55%)
6/11

Grade Now
Project Overview - Marking

Marking:

- The viscosity of water at a temperature of 20 degrees Celsius is approximately 0.01 poise or 10,000 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

Grading:

Qualitative Feedback:
- Comment (5 Words): Good, proofread before submission

Mark based on the assessment criteria below:

<table>
<thead>
<tr>
<th>Literature review</th>
<th>Initial pilot experiment data analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-30</td>
<td>0-30</td>
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<tr>
<td>31-60</td>
<td>31-60</td>
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<tr>
<td>61-100</td>
<td>61-100</td>
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</tbody>
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Demonstrated engagement with relevant theory and literature whilst planning and conducting the experiment

Acquisition and timely analysis of pilot data

Plans for full experiment and analysis, including feasibility and costs

Mark: 77.70/100 (77.78%)
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

Common themes in students’ comments

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”.

Good Opportunities
“……was grateful to be able to use a telescope as part of the work”.

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?