

The effect of remote teaching and learning on the development of students' practical and analytical skills in a Biochemistry module

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- The Covid-19 pandemic has had a significant impact on the UK and the rest of the world, causing widespread disruption.
- The lockdowns had unforeseen consequences on several aspects of British society, including the mental health and practical skills development of students who participated in remote learning.
- This study aims to investigate the effects of the lockdown on Level 4 students' Biochemical Processes module's practical and analytical competencies.
- The laboratory practical tasks in the module are essential for acquiring new skills, testing theories, and reinforcing knowledge.
- Due to the lockdown, we had to alter our approach to delivering the assessed task and support students.

The module

- The Biomedical and Pharmaceutical Sciences Programme offers the Biochemistry module at Level 4.
- This module places a strong emphasis on practical tasks, allowing students to develop new skills, refine existing ones, test theories, and reinforce their learning.
- Each session typically includes two hours of practical work and one hour of lecture. Students are assessed through a practical activity and a written exam, both of which carry equal weight.

A different approach to teaching

- The first lockdown was imposed by the government starting on 27th March 2020.
- Until that day students had the opportunity to take part in practical sessions and in the assessed practical activity.
- In 2021 the lockdown affected the module from the start.
- Preparations made for remote delivery involved a different approach to teaching and assessing, compared with previous years.
- The most affected part of the module was the assessed practical task.

Assessing tasks for feasibility

Catalase activity

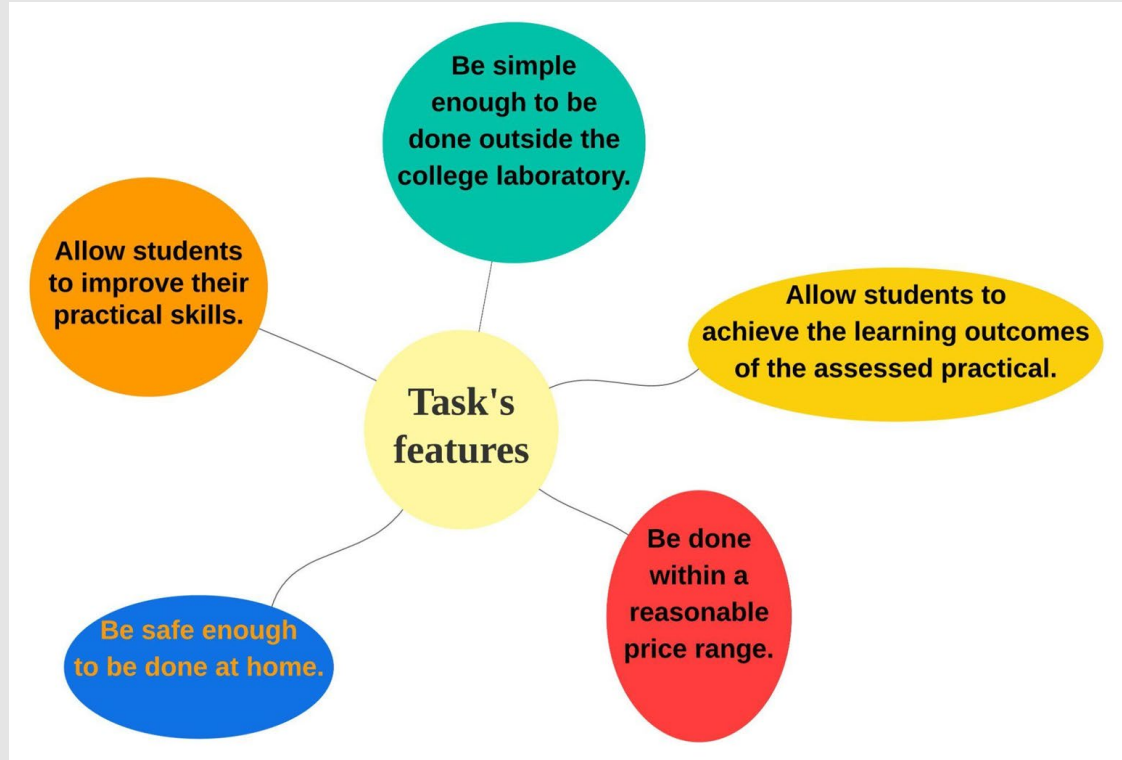
1. Catalase is an enzyme found in potatoes.
2. It breaks down hydrogen peroxide to water and oxygen.
3. Dilute solutions of hydrogen peroxide can be bought from the pharmacy.
4. Family members which are not used to manipulate chemical substances might be affected by it.

Yeast fermentation

1. Yeast fermentation is controlled by specific enzymes.
2. Fermentation involves the breakdown of sugar to alcohol and carbon dioxide.
3. Yeast and sugar are widely used in baking and can be bought from the supermarket.
4. There is a very small chance for the yeast to cause harm to anybody - one student was allergic to yeast.

A different approach to assessing

- We chose a simple, practical task that students could perform at home without any risks to themselves or their families.
- Dr Chris Workman diligently worked on selecting the optimal materials for this task.



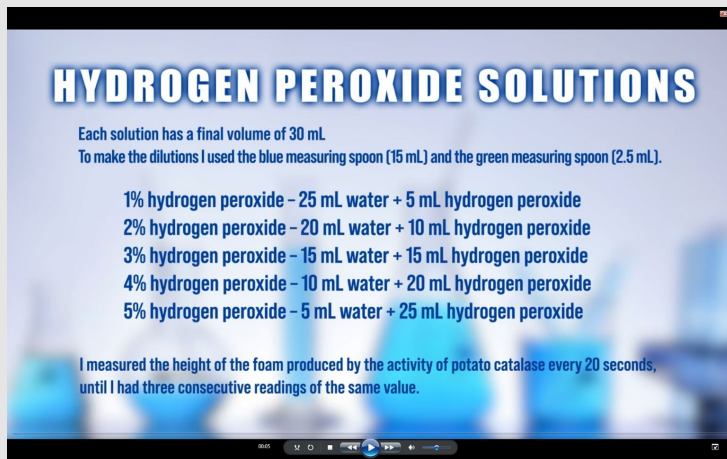
A different approach to assessing

- The method was thoroughly tested in a home kitchen to ensure its effectiveness.
- The college provided students with materials for collecting data in their own homes.
- The delivery service utilized was first-class to ensure prompt delivery of the package to the students.



Pre-test support

- The catalase experiment was chosen as a pre-test activity.
- The step-by-step method was filmed and shared with students before the assessed task.

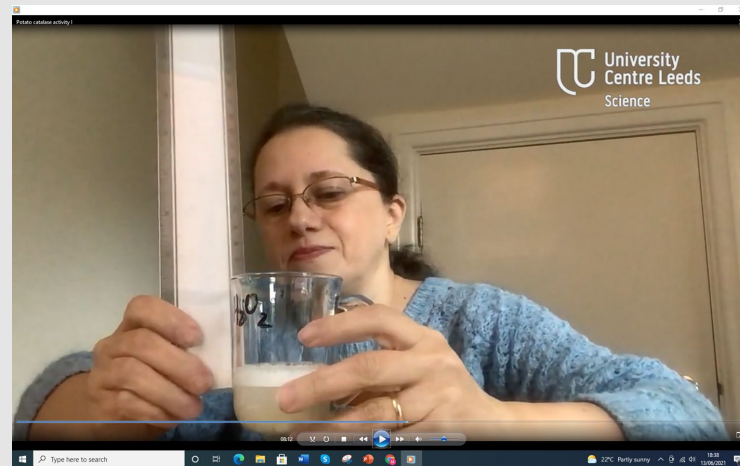


HYDROGEN PEROXIDE SOLUTIONS

Each solution has a final volume of 30 mL.
To make the dilutions I used the blue measuring spoon (15 mL) and the green measuring spoon (2.5 mL).

- 1% hydrogen peroxide – 25 mL water + 5 mL hydrogen peroxide
- 2% hydrogen peroxide – 20 mL water + 10 mL hydrogen peroxide
- 3% hydrogen peroxide – 15 mL water + 15 mL hydrogen peroxide
- 4% hydrogen peroxide – 10 mL water + 20 mL hydrogen peroxide
- 5% hydrogen peroxide – 5 mL water + 25 mL hydrogen peroxide

I measured the height of the foam produced by the activity of potato catalase every 20 seconds, until I had three consecutive readings of the same value.



Post-test support

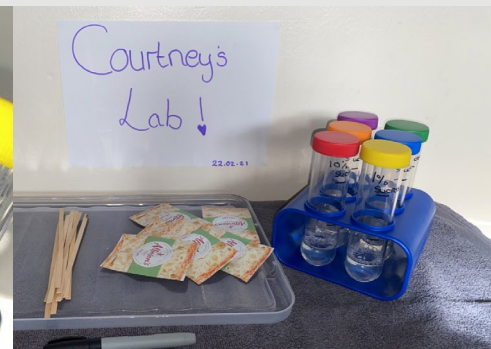
- The post-test support was provided during two workshop sessions delivered after the practical task was completed.



Students feedback

I liked doing the practical like this but my home is not as good for this as the laboratory we have at college.

It's hard to do the practical at home as I want to speak with you directly if I need help, not on Hangouts.

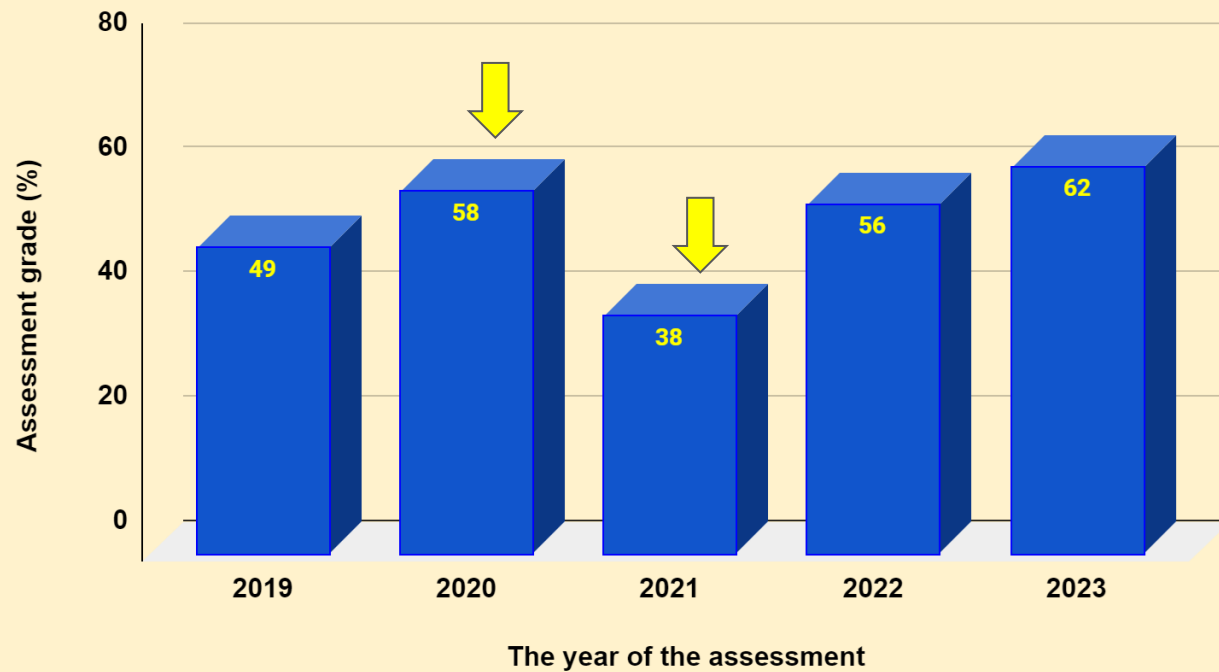


I have my own lab!

Results

- Despite their enthusiasm for completing the assigned tasks at home, the lockdown affected students' grades.
- As we slowly moved away from lockdown, the students returned to college.
- Last year, 2021-2022, the impact of the lockdown on students' behaviour and practical skills was noticeable.
- The students were more anxious and less confident to do any laboratory task.
- The situation changed for the better this year, 2022 - 2023.
- The students were more confident and enjoyed working in the laboratory.

Assessment grades



Factors affecting students' performance

Outside personal control

The quality of
teaching and
learning
experience

The
learning
space

Family
well-being

Poor internet
connectivity

The news
regarding
the
pandemic

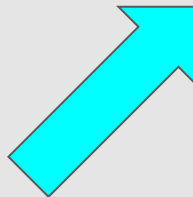
Financial
constraints

Well-being and mental health

Under personal control

Motivation

Individual
learning
habits



Conclusion

- The use of a new assessment method for practical tasks in a module led to a more engaging remote learning experience for students.
- This approach could be useful in situations where a student is unable to participate in laboratory tasks due to personal reasons.
- The results suggest that this approach is effective when students complete similar tasks beforehand.
- While remote learning can promote student independence and motivation, its success can be affected by personal circumstances, as stated by Bubb and Jones (2020) and Wahab (2020).

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