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Piloting Blended Learning (BL) in the Biology Unit in 2011

Investigation of the effectiveness of blended learning as compared to lecture-tutorial style on the teaching of Biology.

**Biology Unit / Science Department
Hwa Chong Institution (College Section)**

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INTRODUCTION

Lessons are conducted in a **lecture-tutorial system** with lectures as the main platform for mass transmission of information to a large number of students.

The challenges faced in teaching H2 Biology topic effectively are:

- ❖ **large lecture size**
- ❖ **diverse learning abilities of students**
- ❖ **nature of the subject**
- ❖ **difficulty in monitoring students' learning during lessons**

INTRODUCTION



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❖ What is Blended Learning (BL)?

1. Mixed learning environment
2. Deep learning
3. Self-directed learners



AIMS

❖ This pilot study therefore aims to investigate:

1. the **effectiveness of blended learning** (as compared to **lecture-tutorial style**) in fostering **better and deeper learning**;

2. the **potentiality of using blended learning** in translating to **improve students' learning**, leading to **better scores in assessments**.



OBJECTIVES

1. To adopt the blended learning approach, whereby **ICT tools** are used in a **systematic and pedagogically sound manner** to support face-to-face teaching of key concepts.
2. To develop **self-directed learning skills** in our students.
3. To develop critical thinking and analytical skills (**deep learning**) in students through collaborative problem-solving activities.

METHODOLOGY



- ❖ **Design and Planning of Blended Learning lessons**
- ❖ **Conducting Blended Learning lessons with observations**
- ❖ **Study Design**





METHODOLOGY

- ❖ 2 JC1 classes (11S74 and 11S75) pulled out from Main Lecture Group in Term 2.

- ❖ Topics used for blended learning:

- (i) DNA Structure (2 weeks)**

- ☐ 3 lessons, each 1 hr

- (ii) Cell & Nuclear Division (2 weeks)**

- ☐ 2 lessons, each 1.5 hr

- ☐ 3 lessons, each 1 hr

LESSON STRUCTURE

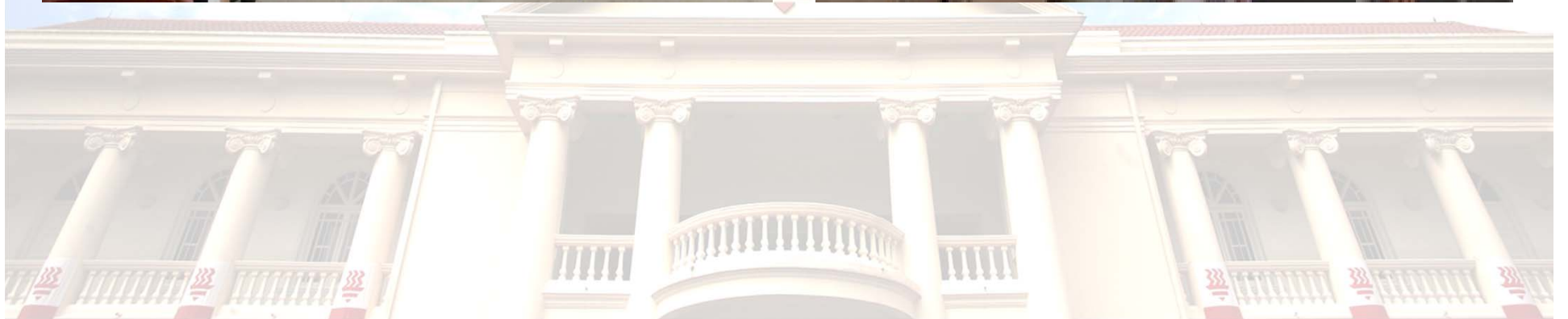


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1. Key concepts were taught via:
 - Just-in-Time Teaching (JiTT)
 - Use of Biological Modelling
 - Use of Videos and Animations
 - Collaborative Learning
 - E-learning Tasks
 - Integrative Formative and Summative Assessments
2. Supported by the following **ICT tools** such as
 - Moodle**
 - Multimedia worksheets**
3. All lessons conducted **classroom style** at computer labs



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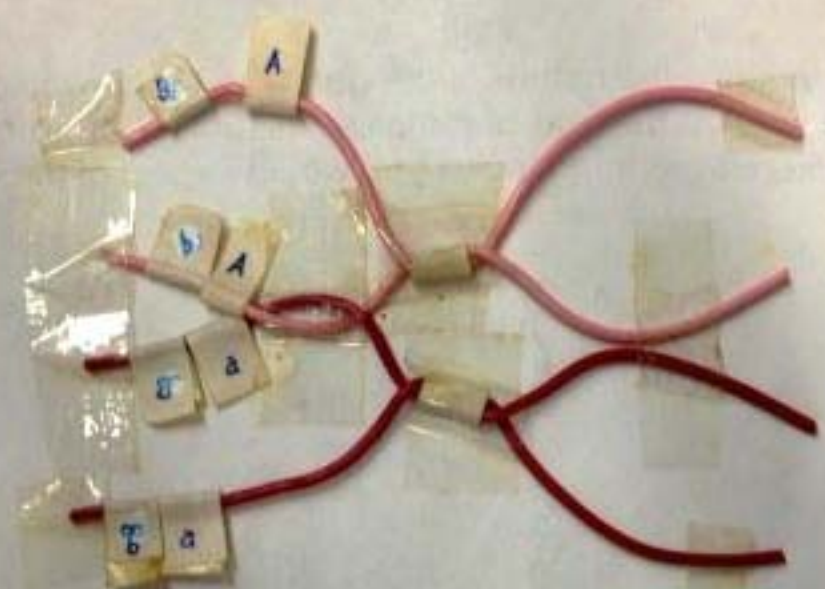




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Space for chromosome model



LESSON STRUCTURE (Pre-Lesson)

PRE TEST

Students in BL class is given an additional set of reading materials (condensed notes focusing on key concepts based on LOs)

Students to read relevant parts of notes and watch animations & answer simple online quiz before each lesson
❖ Post & Answer questions in Moodle's discussion forum

Tutors to prepare parts of topics which students find puzzling/difficult based on forum responses (**JiTT**)



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- Demo



LESSON STRUCTURE (During Lesson)



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Tutors to highlight learning difficulties based on forum questions

Tutors to prepare activities based on the specific LOs e.g. pair-work / group-work, hands on modelling

Tutors to teach difficult concepts using the activities

Formative assessment (short tutorial questions)



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LESSON STRUCTURE (Post Lesson)



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Students post more questions in discussion forum in Moodle if they still do not fully understand certain concepts. Tutor to answer the questions and address misconceptions

Repeat of Cycle

POST TEST and STUDY DESIGN

STUDY DESIGN



❖ Pen and Paper Survey I

- ❑ Written responses to 3 open-ended questions on Blended Learning
- ❑ Sample Size: 52 students (11S74 & 11S75)
 - How was the **use of blended learning** for these two series of topics **improved/enhanced** your learning compared to the other topics?
 - Do you like this **method of teaching and learning**? Give your reason(s).
 - Any other comments?

RESULTS & DISCUSSION



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Positive responses

Percentage of
positive
responses

- ❖ Lessons are **tailored to the students' aptitude and needs** in the class. The tutors **adjusted the pace of lessons** so that it suits the class.
- ❖ The tutors **spends more time on difficult concepts**, delivering them with **greater depth and clarity**.
- ❖ This makes **concepts and ideas easier to understand**.

89.8%

RESULTS & DISCUSSION



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POSITIVE RESPONSES

❖ Reading through the questions posted by my classmates on the discussion forum also helped me **to clear doubts on the various concepts I struggled with and deepened my understanding** on these concepts.

❖ The use of **interactive videos and animations** enhances my learning as I am able to **visualize concepts easily**.

❖ Blended learning **requires pre-lesson preparations and reading**. This helps me to **understand the topics better** even before the lesson has started.

❖ Blended learning allows for **more interaction with the teacher**, similar to tutorials. If any doubts arise during the lesson, they can be **clarified straight immediately**. This is unlike the lecture system.

RESULTS & DISCUSSION



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NEGATIVE RESPONSES

❖ Blended learning tends to be **more time-consuming** than the standard lecture-tutorial system. This is due to the **increased amount of pre-lesson preparations required**. Such a situation would be quite **taxing for students** with a significant amount of homework from other subjects.

❖ The **notes for blended learning are less comprehensive** than the lecture notes. Hence, this means that we would have to go through the lecture notes as well, which is quite time-consuming.

❖ There might be **certain differences in which some concepts are taught** compared to the normal lecture group. Hence there might be **no standardization in terms of terminology and expressions** used.



STUDY DESIGN

❖ Pen and Paper Survey II

❑ 10 questions

❑ Five-level Likert scale (1 to 5)

1	2	3	4	5
Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree



RESULTS & DISCUSSION



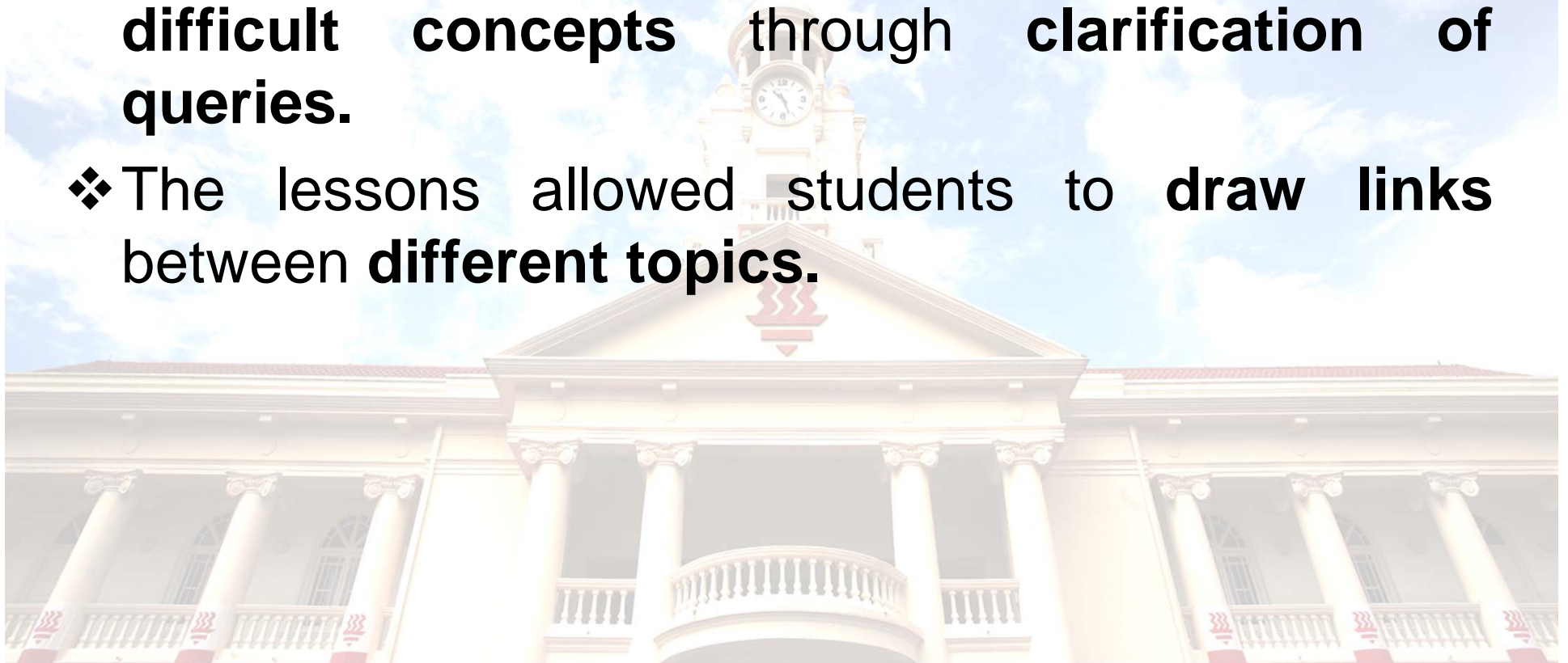
QUESTION 88	SD	D	N	A	SA
I understand the concepts taught in blended learning lessons better than the lecture-tutorial system.	0%	10%	39%	37%	14%
QUESTION 89	SD	D	N	A	SA
I have more opportunities to clear doubts in blended learning lessons compared to the lecture-tutorial system.	0%	2%	18%	53%	27%
QUESTION 94	SD	D	N	A	SA
The blended learning lessons help me draw links between different subtopics / topics.	2%	10%	47%	37%	4%
QUESTION 96	SD	D	N	A	SA
I find that blended learning lessons are effective in helping me to learn the concepts.	0%	4%	25%	57%	14%

RESULTS & DISCUSSION



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- ❖ The lessons **strengthened students' grasp of concepts.**
- ❖ The lessons **enhanced their comprehension of difficult concepts** through **clarification of queries.**
- ❖ The lessons allowed students to **draw links between different topics.**



RESULTS & DISCUSSION



QUESTION 90	SD	D	N	A	SA
I find that the discussion forum is a useful avenue for my tutors to help me in clarifying doubts.	2%	16%	39%	37%	6%
QUESTION 91	SD	D	N	A	SA
The blended learning lessons allow me to learn from others through the questions posted by other students.	2%	12%	21%	49%	16%
QUESTION 92	SD	D	N	A	SA
The blended learning lessons allow me to reflect on my learning progress and gauge my level of understanding.	2%	4%	49%	41%	4%



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RESULTS & DISCUSSION

- ❖ Learning from peers was facilitated by tutors' responses to questions in the discussion forum posted by students.





RESULTS & DISCUSSION

QUESTION 93	SD	D	N	A	SA
The use of varied teaching methods such as the questioning and answering of specific concepts on the discussion forum, use of ICT, and the use of models allows me to reinforce my conceptual understanding of the topics.	0%	12%	33%	43%	12%

❖ The use of ICT, models and discussion forum greatly enhanced and facilitated better learning in the students



RESULTS & DISCUSSION

QUESTION 95	SD	D	N	A	SA
I think the amount of time and effort invested by the tutors in designing the blended learning lessons are worthwhile.	0%	6%	16%	63%	14%

- ❖ Students perceived **tutors' preparation for the blended learning lessons** as demonstration of **their interest in students' learning.**



RESULTS & DISCUSSION

QUESTION 97	SD	D	N	A	SA
I think blended learning lessons should be conducted for other topics.	2%	16%	43%	25%	14%

- ❖ Students' opinions on **possible extensions of the blended learning lessons** were more divided.





STUDY DESIGN

- ❖ **Pre- and Post-Lesson Quizzes.**
- ❖ **“Blended Learning Group” vs. “Control Group”.**
- ❖ **Mean deviation in raw score of pre-lesson quiz from post-lesson quiz for each group as an improvement (positive difference) or a drop (negative result) in results .**



RESULTS & DISCUSSION

CG	TOPIC 1 (DNA STRUCTURE)			TOPIC 2 (CND)		
	Pre Test Mean	Post Test Mean	Mean Difference	Pre Test Mean	Post Test Mean	Mean Difference
11S74 (BL)	5.60	7.44	+1.84	7.88	8.65	+0.77
11S75 (BL)	4.77	7.08	+2.31	5.12	6.58	+1.46
11S77 (C)	4.46	6.65	+2.19	7.27	7.77	+0.50
11S79 (C)	6.36	6.51	0.00	6.65	6.79	0.00



REFLECTIONS

- ❖ Lessons will be more beneficial if students **put in the effort & are motivated.**
- ❖ Suitable for **self-directed review** after lectures & tutorials rather than main method of teaching when students come in contact with the content for the first time.
- ❖ **Limited curriculum time & students' time** to carry out **independent work and debrief**
- ❖ **Limited manpower.**

CONCLUSION

- ❖ Blended learning has improved **students' learning of the topics.**
- ❖ **Blended Learning lessons are tailored to students' aptitude and needs.**
- ❖ **Tutors able to address any likely misconception**
- ❖ **Students able to draw links between topics.**
- ❖ **The lessons hence fosters not only better, but also deeper learning.**



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Building a Paper DNA Model Activity!

