

THE CHINESE UNIVERSITY OF HONG KONG

Courseware Development Grant (2018-19)

Final Report

Report due 31 May 2019

Please return by email to CUHK cdgs@cuhk.edu.hk

PART I

Project title: Articulation of Metabolic Pathways Using Articulate Storyline (Oi-Volcano)

Principal supervisor: Dr LEE Kit Ying, Rebecca

Co-supervisor(s): Dr NG Yuen King, Dr YEUNG Hang Mee Po

Other members of the Project Team: Ms Daisy CHEN, Mr NG Yat Nam

Department / Unit: School of Biomedical Sciences

Project duration: From September 2018 to May 2019

Date report submitted: 23 May 2019

1. Project objectives

Teaching biochemical pathways can be extremely challenging. Students always encounter difficulties in studying biochemical pathways, and how these pathways are linked up together. This interactive courseware aims at arousing students' interest in learning lipid metabolism using the Articulate Storyline eLearning authoring software. The first four phases of the *Metabolism Metro* have been completed already. According to the feedback of the students, they all thought that the courseware helped their learning.

“Oi-volcano” is one part of the “*Metabolism Metro*” project. The *Metabolism Metro* is a self-learning tool which aims to arouse students' interest in exploring human metabolic pathways. The first 4 phases of the courseware were completed with satisfactory feedback. These include: Phase 1: Laminolegoland (supported by TDLEG), Phase 2: AG City (supported by OME), and Phase 3: Sweetieland (supported by CDG), and Phase 4: Powerland (supported by MMCD).

Phase 5 “Oi-volcano” is the continuance of Phase 4 “Powerland”. In this project, we have used the Agile Model for our courseware development. The advantage of this method is that we can breakdown our courseware into various phases, so that we can collect feedback from students at the end of each phase and fine-tune our courseware before we move on to develop the next phase. According to the feedback collected in previous phases, we have added a new function “the game mode” in this phase and students can learn metabolic pathways not only through animations but also

through mini-games. We have also fine-tuned Phase 1, the Laminolegoland, and modified the user interface as well as upgraded the performance of video-play to speed up the loading time of the courseware on Blackboard.

This project follows the original project objectives and most students think that the courseware helps them understand the course content better.

2. Process, outcomes or deliverables

This courseware will be used in two courses: MEDU2600 Molecular Medicine and Genetics and SBMS1103 Biochemistry of Human Body.

Timeline of the project development:

Date	Phase	Activities
Project Phase		
Sept, 2018	Preparation	Setup content of topics
Oct, 2018 – Feb, 2019	Preparation and development	- Development of courseware - Game setup - Graphics + narration by Articulate Storyline
Mid-Mar, 2019	First trial-run	Launching of the trial version. Students taking the course SBMS1103 Biochemistry of Human Body were invited to try the courseware.
Mid-Apr, 2019	Evaluation	Collection of feedback from students for further improvement of the courseware
Early May, 2019	Report Writing	Writing of the report
Post-Project Phase		
Jun – Aug 2019	Improvement	Courseware improvement
2019-20 Term 1	Dissemination	Launching the courseware for the class MEDU2600 Molecular Medicine and Genetics
2019-20 Term 2	Dissemination	Launching the courseware for the class SBMS1103 Biochemistry of Human Body

There is no major change in the deliverables and the project was completed satisfactorily.

3. Evaluation Plan

We distributed hard copies of evaluation form to collect students' feedback on the courseware in mid-Apr. We also collected monitoring data for this courseware from Blackboard, including whether the students tried the courseware, and the points they obtained in the mini-games.

The courseware questionnaire contains 22 questions, 17 questions are related to the courseware utilization and students' satisfactory level on the courseware, and 3 open-ended questions in collecting their comments for improvement. The questionnaire is attached in Appendix 1.

There were 27 students in the class, and 23 students had filled in the questionnaire (% of questionnaire received: 85%). Among these 23 students, 22 of them had used the courseware. 77% of the students strongly agree/agree that the courseware motivated them to learn by arousing their interest and curiosity towards the subject (Question 5). 86% of the students strongly agree/agree that the courseware helped to improve their understanding of difficult concepts (Question 6). 91% of the students strongly agree/agree that the courseware allowed them to learn at their own pace (Question 7). 73% of the students strongly agree/agree that the courseware helped them understand the course content better (Questions 8). 81% of the students strongly agree/agree that the courseware could highlight important concepts (Questions 9). 77% of the students strongly agree/agree that the Oi-Volcano facilitated their understanding towards lipid metabolism (Question 10). 77% of the students strongly agree/agree that short animations in the Oi-Volcano enabled them to understand the fatty acid synthesis step-by-step (Question 11). 68% of the students strongly agree/agree that mini-games in the Oi-Volcano enabled them to understand key steps in lipid metabolism (Question 12). 63% of the students liked the coins mode as it allowed them to know how many marks they got in the mini-games (Question 13). 77% of the students strongly agree/agree that the coins mode in the courseware motivated them to answer the questions in the mini-games (Question 14). 82% of the students strongly agree/agree that flashcards in the revision mode allowed them to recall the chemical structures and functions of different biomolecules (Question 15). 86% of the students strongly agree/agree that flashcards in the revision mode allowed them to recall how biomolecules participated in multiple pathways (Question 16). 91% of the students strongly agree/agree that the courseware is attractive (Question 18). They all strongly agree/agree that the courseware is easy to use (Question 17). In general, they are satisfied with the courseware (Question 19) (Appendix 2).

We also asked three open-ended questions. "What do you like most in the Oi-Volcano", "What could be improved in the Oi-Volcano?" and "What could be improved in the courseware?" We aimed to collect written feedback from students for courseware improvement.

4. Dissemination, diffusion and impact

This project was started in September 2018. We have launched the trial version in early March and the Year 1 Biomedical Sciences students (course: SBMS1103 Biochemistry of Human Body) were invited to try the courseware. Feedback was collected from the students in mid-April for improvements before launching the courseware in academic year 2019-2020 for the courses MEDU2600 (target group: ~250 Year 2 MBChB students) and SBMS1103 (target group: ~35 Year 1 Biomedical Sciences students). The courseware is integrated in the CU eLearning system (Blackboard). The advantage of incorporating the micro-modules in both semesters is that we can launch a trial run for student feedback collection in the second term, so that improvements can be made during the summer break and the modified version can be launched in the new academic year. This early student-feedback collection is very useful for project improvement in not only our project, but also projects in other disciplines as well.

We used the Agile Model for our courseware development and feedback was collected from students at the end of each project phase and made modifications accordingly. In this project, we have fine-tuned the Phase 1 courseware and modified the user-interface (Figure 1 and 2).



Figure 1. Fine-tune of Phase 1 “Laminolegoland”. Old version (left) and new version (right) with addition of map and audio button (red rectangle).

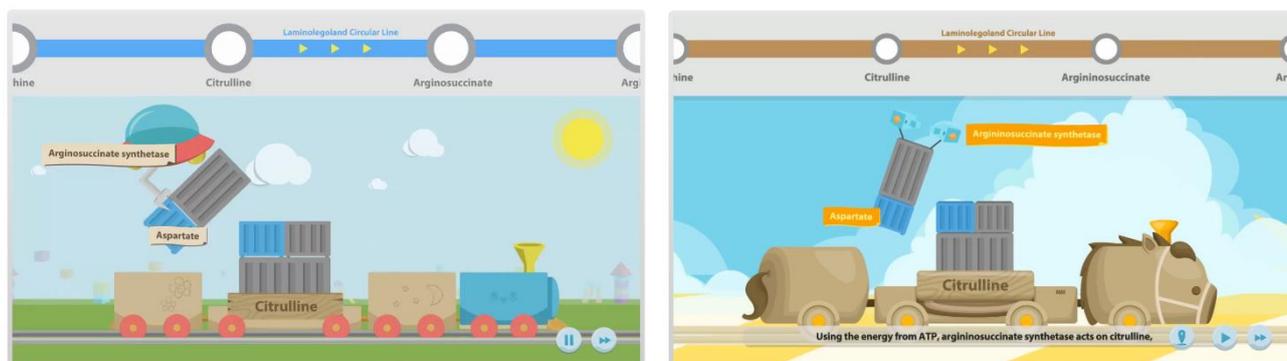


Figure 2: Addition of subtitles in the animation and a map button in the new version (right). There is no subtitle in the old version (left).

We also finished the story mode and revision mode of “Oi-Volcano”. In the story mode, besides animation, we have added mini-games to test students’ understanding towards lipid metabolism. Their marks will be calculated by the number of coins gained if they answered the questions correctly (Figure 3).

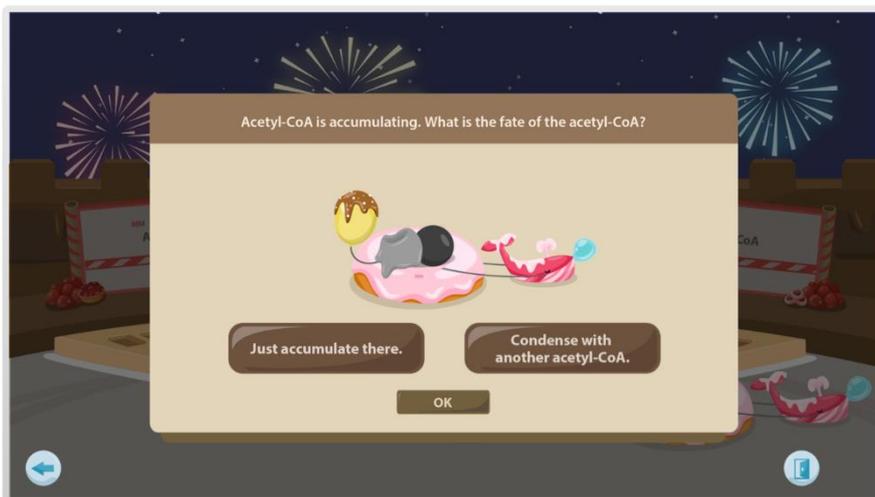


Figure 3. Mini-games in the courseware.

This courseware will be integrated in the CU eLearning system (Blackboard). We shared our courseware production in the Teaching and Learning Innovation Expo in December 2018. The micro-modules in this courseware are suitable for all Biochemistry metabolism courses. We will fine-tune our courseware later on and hope that it can be accessed by the public when the whole project is finished, so that students who are interested can learn biochemical pathways in an easy-to-understand manner.

PART II

Financial data

Funds available:

Funds awarded from CDG	\$	89295
Funds secured from other sources (please specify _____)	\$	0
Total:	\$	89295

Expenditure:

Item	Budget as per application	Expenditure	Balance

Contract for Service for multimedia development	38800	38800	0
Project production and blackboard support	44765	44312	453
Promotional materials	5730	5500	230
Total:	89295	88612	683

PART III

Lessons learnt from the project

Key success factors:

In this project, a few software was used, including Adobe Illustrator and After Effects for graphics design and animation production. Students like this kind of visual representation as this can give them an overall picture of the whole pathway and abstract concepts can be explain in a clearer manner using animations. Mini-games were designed to facilitate students to recall the concepts of the course when they used the courseware on Blackboard. The coin collector plays a key role to engage students in the game-design environment so that they could learn in an interactive way with an explicit goal.

It might be an advantage for launching a trial version of the courseware first. Feedbacks were collected from students so that we can fine-tune the courseware according to their comments before we launch our real version to the students in the next academic year.

We would like to send our deep appreciation to colleagues from ITSC for their continuing support in this courseware, and their professional advices. This project is for sure unable to finish on time without their help.

Difficulties:

There has been no obvious obstacle during the production process. However, a student who participated in the evaluation commented that fluidity in the courseware can be improved as loading time was a bit long. We will continue to monitor the performance of SCORM object/ HTML5 on Blackboard site.

PART IV

Information for public access

1. Keywords

Please provide five keywords (in the order of relevance to your project) to describe your project.

(Most relevant) Keyword 1: Lipid metabolism

Keyword 2: Metabolic pathway

Keyword 3: Metabolism

Keyword 4: Biochemistry

(Least relevant) Keyword 5:

2. Summary statistics

Please provide information, if any, in the following tables, and provide the details in Part I.

Table 1: Publicly accessible online resources (if any)
(a) Project website: <i>If a publicly accessible project website has been constructed, please provide the URL</i>
(b) Webpage(s): https://blackboard.cuhk.edu.hk <i>If information of your project is summarized in a webpage (say a page in the department's or faculty's website), please provide the URL(s) in here</i>
(c) Others (please specify):

Table 2: Resource accessible to a target group of students (if any)			
<i>If resources (e.g. software) have been developed for a target group of students (e.g. in a course, in a department) to gain access through specific platforms (e.g. CU Learning Management System (Blackboard), facebook), please specify.</i>			
<u>Course Code/ Target Students</u>	<u>Term & Year of offering</u>	<u>Approximate No. of students</u>	<u>Platform</u>
MEDU2600	1 st term, 2019	250	Blackboard
SBMS1103	2 nd term, 2020	35	Blackboard

Table 3: Presentation (if any)	
<i>Please classify each of the (oral/poster) presentations into one and only one of the following categories</i>	Number
(a) In workshop/retreat within your unit (e.g. department, faculty)	-
(b) In workshop/retreat organized for CUHK teachers (e.g. CLEAR workshop, workshop organized by other CUHK units)	-
(c) In CUHK ExPo jointly organized by CLEAR and ITSC	3 Poster presentations (Phase 1, 2, and 3 of this courseware)
(d) In any other event held in HK (e.g. UGC symposium, talks delivered to units of other institutions)	1 Oral presentation (Phase 1 & 2 of the project) (Canvas User Group Forum 2017 organized by the City University of Hong Kong)
(e) In international conference	(e) In international conference
(e) In international conference	1 Oral presentation (Phase 1 & 2 of the project) (eLearning)
(f) Others (please specify)	-

Table 4: Publication (if any)	
<i>Please classify each piece of publications into one and only one of the following categories</i>	Number
(a) Project CD/DVD	<i>Please insert no</i>
(b) Project leaflet	<i>Please insert no</i>
(c) Project booklet	<i>Please insert no</i>
(d) A section/chapter in a booklet/book distributed to a limited group of audience	<i>Please insert no</i>
(e) Conference proceeding	<i>Please insert no</i>
(f) A chapter in a book accessible internationally	<i>Please insert no</i>
(g) A paper in refereed journal	<i>Submitted an article to the journal "Biochemistry and Molecular Biology Education", under review</i>
(h) Others (please specify)	<i>Please insert no</i>

3. A one-page brief write up

Students always encounter difficulties in studying biochemical pathways. They are especially weak in understanding the lipid metabolism, especially the pathway integration. This interactive courseware aims at arousing students' interest in learning lipid metabolism using the Articulate Storyline eLearning authoring software.

In this project, the "*Oi-volcano*" was developed as pre-class learning micromodules for students to go through lipid metabolism before class. These micromodules are presented as interactive animations and mini-games. Besides, a *Revision mode* was designed as post-class revision micromodules. Students are expected to go through these micromodules during their revision after class. Students can revise what they have learnt in an interactive way by clicking on the metro map to magnify the region of interest. Information of each molecule (metabolite) are shown as metro stations. They can study the chemical structures and functions of metabolites one by one, and to understand how those molecules link multiple pathways together.

This interactive self-learning tool is packaged as a courseware using the Articulate Storyline eLearning authoring software.

Metabolism Metro (Oi-Volcano) Courseware Questionnaire (2018-19)

Aim of this project

Students always encounter difficulties in understanding abstract metabolic pathways as well as their integration. The *Metabolism Metro* was designed to facilitate students' learning of biochemical pathways. This courseware is a self-learning tool which aims to arouse students' interest in exploring human metabolic pathways. We would like to know what you think about the courseware. All information collected is for evaluation purposes only and will be kept in strict confidence.

Part A: Background

- What was your highest qualification achieved in secondary school?
IB DSE Others: (Please specify: _____)
- What is your highest academic qualification of Biology attained?
F.1/Grade 7 F.2/Grade 8 F.3/Grade 9 F.4/Grade 10
F.5/Grade 11 F.6/Grade 12 F.7/Grade 13
Others: (Please specify: _____)
- Have you ever used the courseware?
Yes No (This is the end of the questionnaire)
- How often did you use the courseware during the course?
1 time only 2 - 5 times 6 - 10 times More than 10 times

Part B: About the courseware

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
5. The courseware motivated me to learn by arousing my interest and curiosity towards the subject.	⑤	④	③	②	①
6. The courseware helped to improve my understanding of difficult concepts.	⑤	④	③	②	①
7. The courseware allowed me to learn at my own pace.	⑤	④	③	②	①
8. The courseware helped me to understand the course content better.	⑤	④	③	②	①
9. The courseware could highlight important concepts.	⑤	④	③	②	①
10. The Oi-Volcano facilitated my understanding towards lipid metabolism.	⑤	④	③	②	①
11. Short animation in the Oi-Volcano enabled me to understand the fatty acid synthesis step-by-step.	⑤	④	③	②	①
12. Mini-games in the Oi-Volcano enabled me to understand key steps in lipid metabolism.	⑤	④	③	②	①

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
13. I like the coins mode as it allowed me to know how many marks I get in the mini-games.	⑤	④	③	②	①
14. The coins mode in the courseware motivated me to answer the questions in the mini-games.	⑤	④	③	②	①
15. Flashcards in the revision mode allowed me to recall the chemical structures and functions of different biomolecules.	⑤	④	③	②	①
16. Flashcards in the revision mode allowed me to recall how biomolecules participated in multiple pathways.	⑤	④	③	②	①
17. The courseware is easy to use.	⑤	④	③	②	①
18. The courseware is attractive.	⑤	④	③	②	①
19. In general, I am satisfied with the courseware.	⑤	④	③	②	①

Part C: Open-ended Questions

20. What do you like most in the Oi-Volcano?

21. What could be improved in the Oi-Volcano?

22. What could be improved in the courseware?

Part D: Contact Information (Optional)

We may fine-tune the courseware according to your feedback and comments in the future. Please leave your contact information below in case we need to follow up with you.

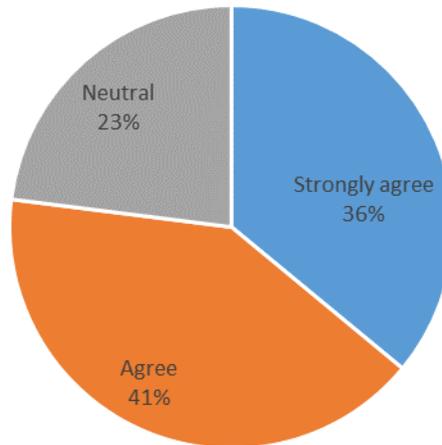
Name: _____

Email: _____

Courseware Development Grant (2018-19)
Articulation of Metabolic Pathways Using Articulate Storyline (Oi-Volcano)

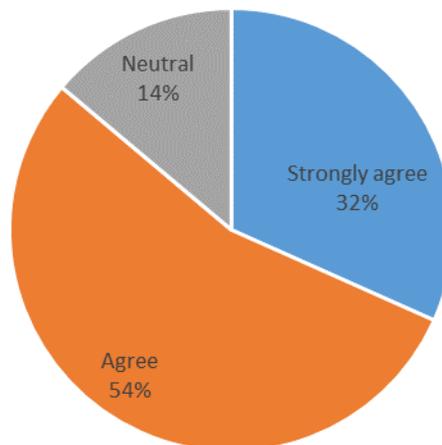
Question 5

The courseware motivated me to learn by arousing my interest and curiosity towards the subject.



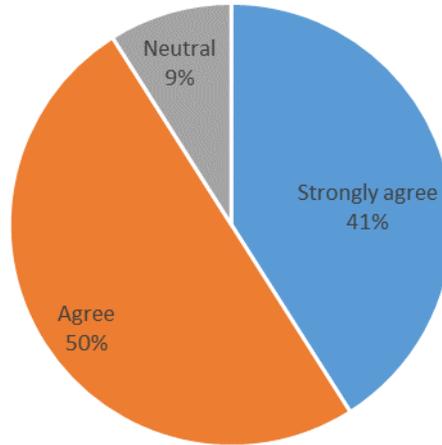
Question 6

The courseware helped to improve my understanding of difficult concepts.



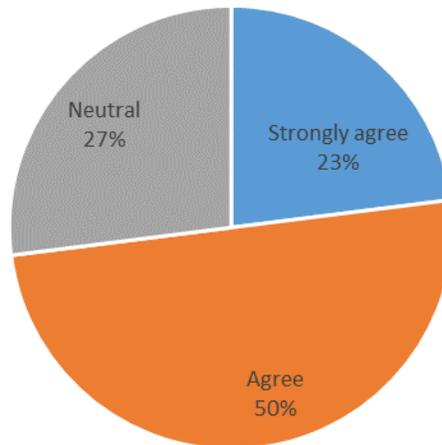
Question 7

The courseware allowed me to learn at my own pace.



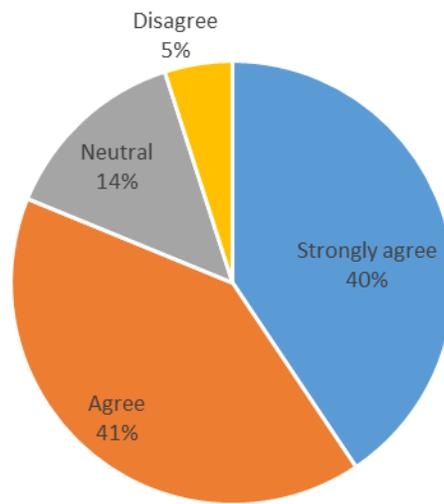
Question 8

The courseware helped me understand the course content better.



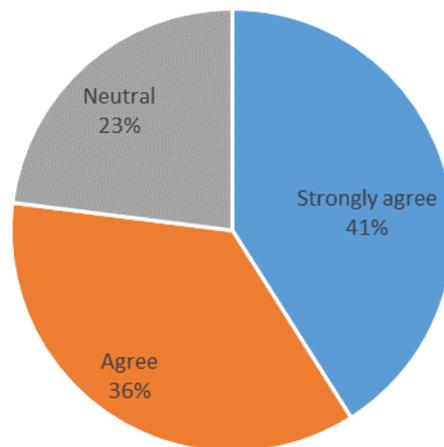
Question 9

The courseware could highlight important concepts.



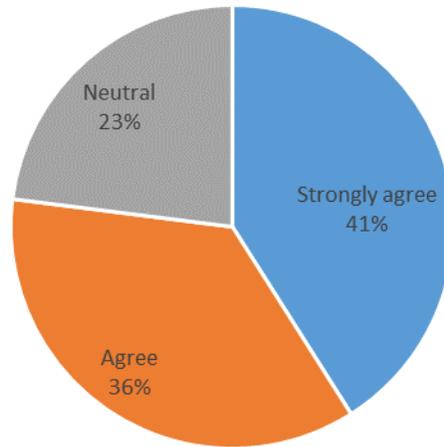
Question 10

The Oi-Volcano facilitated my understanding towards lipid metabolism.



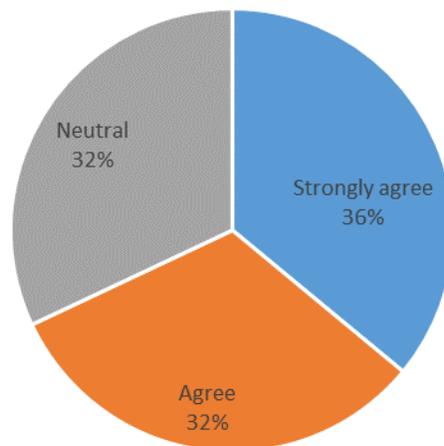
Question 11

Short animations in the Oi-Volcano enabled me to understand the fatty acid synthesis step-by-step.



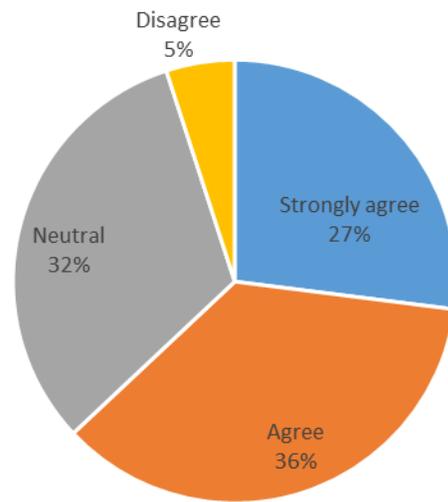
Question 12

Mini-games in the Oi-Volcano enabled me to understand key steps in lipid metabolism.



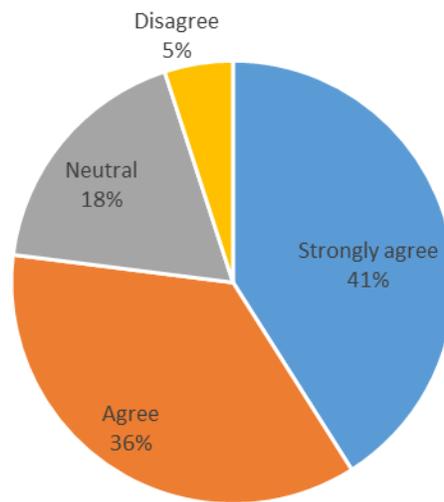
Question 13

I like the coins mode as it allowed me to know how many marks I get in the mini-games.



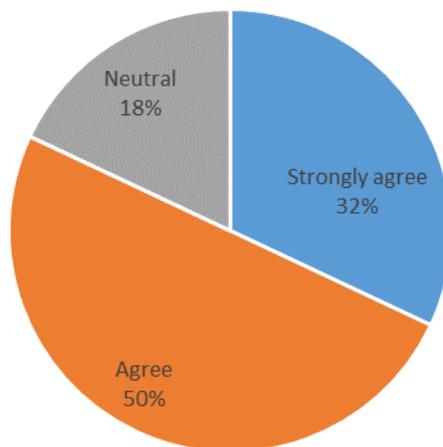
Question 14

The coins mode in the courseware motivated me to answer the questions in the mini-games.



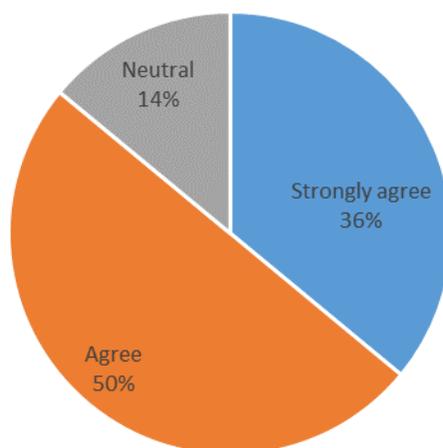
Question 15

Flashcards in the revision mode allowed me to recall the chemical structures and functions of different biomolecules.



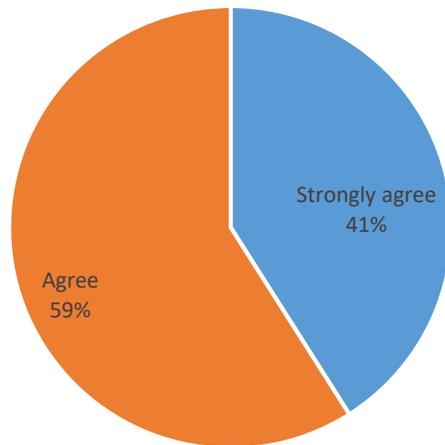
Question 16

Flashcards in the revision mode allowed me to recall how biomolecules participated in multiple pathways.



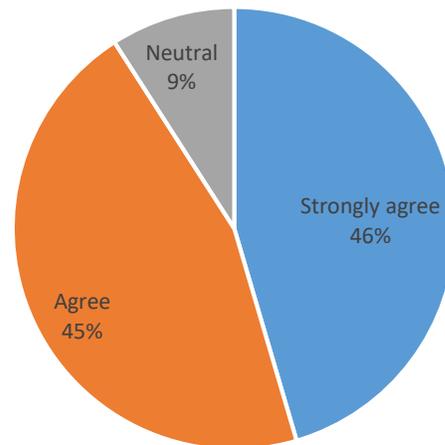
Question 17

The courseware is easy to use.



Question 18

The courseware is attractive.



Question 19

In general, I am satisfied with the courseware.

