Implementing online question generation to foster reading comprehension

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Outline

- Introduction
- Literature Review
- Methodology
- Results
- Discussion and Conclusion

Background of the Study

- Reading academic textbooks has been recognized as a crucial skill for EFL college students to acquire content domains knowledge (Liu, Chen & Chang, 2010; Salinger, 2003).
- A lot of EFL students fail to prepare themselves for the reading demands of higher education (Dreyer & Nel, 2003).
- They have difficulty in reading comprehension, and have a lack of cognitive strategies to remedy their comprehension breakdown.

Background of the Study

Drawbacks in English reading instruction

- Students merely follow the teachers’ instruction and answering teacher-generated questions (Gillespie, 1990; Miciano, 2002).
- Teachers often devote much time to testing students’ reading comprehension rather than teaching reading strategies (Liang & Dole, 2006).
- Teachers evaluate students’ reading comprehension based merely on students’ performance on reading comprehension tests (Dreyer & Nel, 2003).

A solution: Online Question Generation

- **Self-generated tests can** improve students' reading comprehension by engaging students in comprehension fostering and comprehension monitoring (Palincsar & Brown, 1984).
- Through the online question generation, teachers can monitor students’ learning processes and tap into students’ learning difficulties (Schacter et al., 1999)
- Peer assessment fosters the interactive conversations and information exchanges in the online question generation process between question evaluators and question generators (Yu, Liu & Chan, 2003)

Purpose of the Study

- This study aimed to investigate students’ reading comprehension **improvement** and **processes** after implementing online question generation.

Research Questions

Question 1:

To what extent was students' reading comprehension improved after implementing online question generation?

Question 2:

What processes were involved in students' online question generation that affected their reading comprehension?

Signifiance of the Study

- This study, through online action log, disclose what reading comprehension processes are involved in question generation. Specifically, how the students comprehend reading materials to generate questions has not been explicitly investigated.
- This study adopted what students reported in questionnaires and the actual extent of their learning, as demonstrated on subsequent evaluations.

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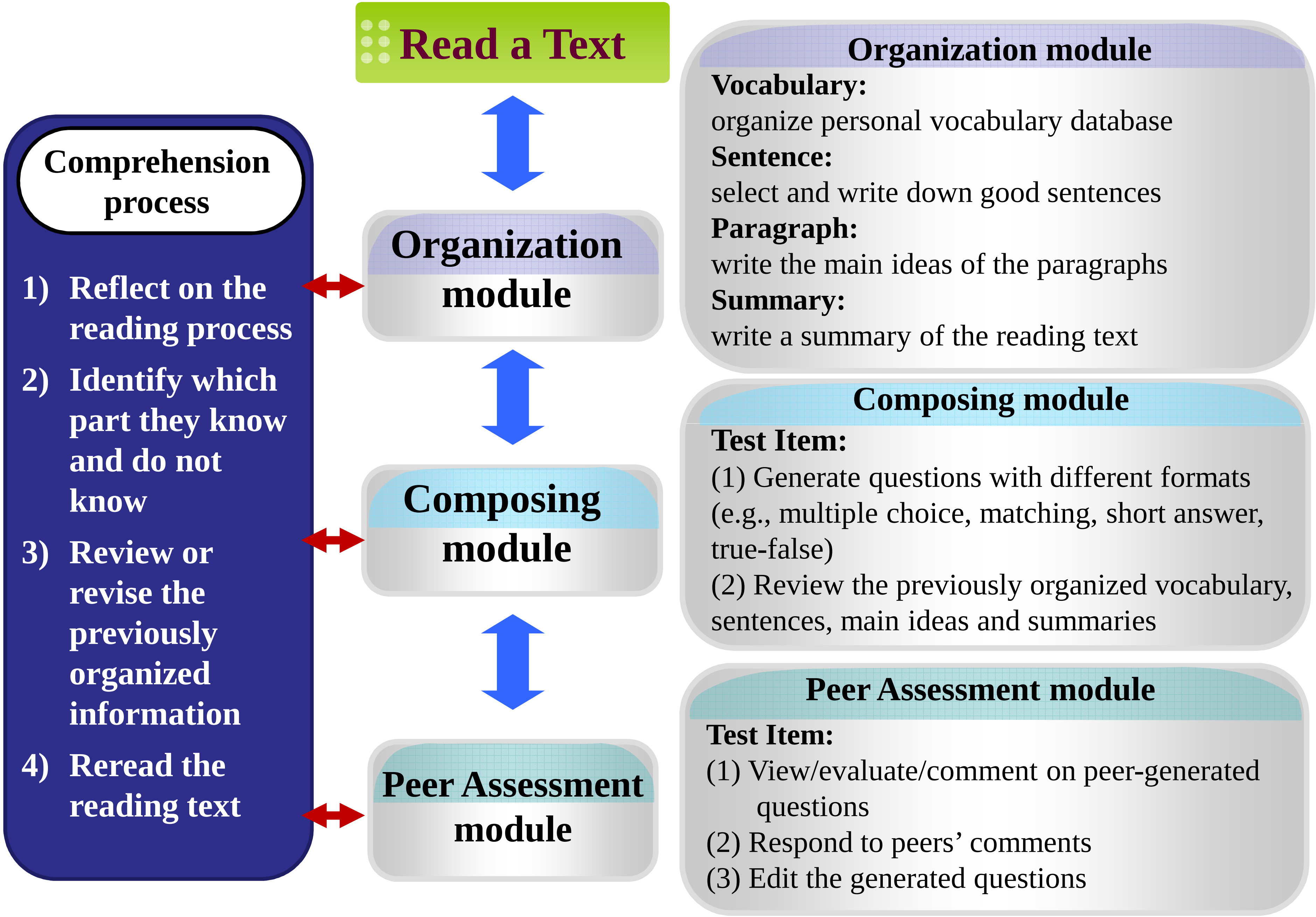
Method

Participants

- 19 participants in the *English Reading Instruction Program* received 11 weeks of English instruction.
- Based on the gain scores of the pre- and post TOEIC scores, they were classified into two groups: students who made more progress (the MP Group) and students who made less progress (the LP Group).
- One case was selected from the MP and LP group respectively to represent how they underwent the three different modules to generate online questions.

Instructional Framework of Online Question Generation



Read a Text

Organization module

Composing module

Peer Assessment module

Comprehension process

1) Reflect on the reading process
2) Identify which part they know and do not know
3) Review or revise the previously organized information
4) Reread the reading text

Organization module

Vocabulary:
organize personal vocabulary database
Sentence:
select and write down good sentences
Paragraph:
write the main ideas of the paragraphs
Summary:
write a summary of the reading text

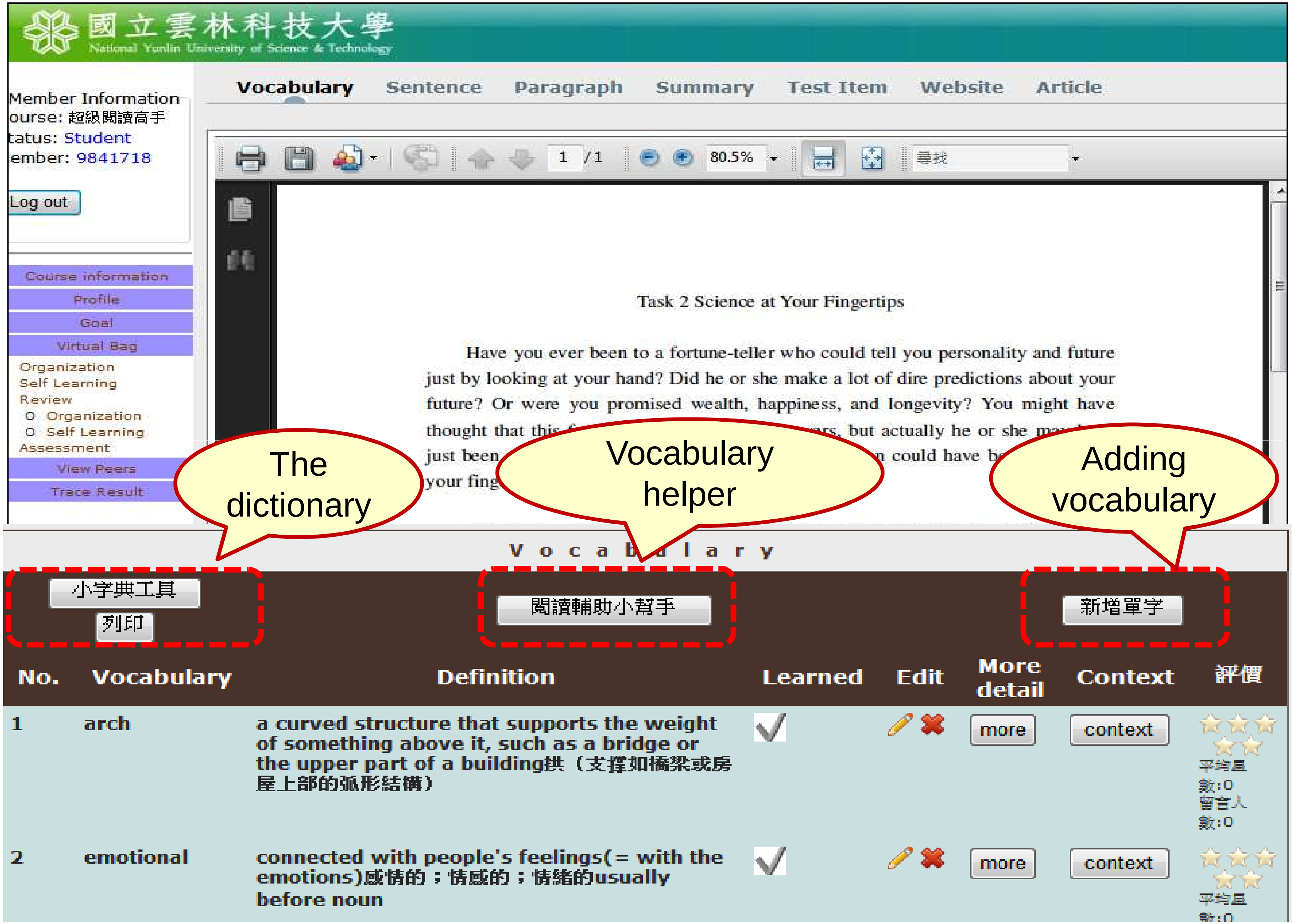
Composing module

Test Item:
(1) Generate questions with different formats (e.g., multiple choice, matching, short answer, true-false)
(2) Review the previously organized vocabulary, sentences, main ideas and summaries

Peer Assessment module

Test Item:
(1) View/evaluate/comment on peer-generated questions
(2) Respond to peers' comments
(3) Edit the generated questions

In the organization module- Vocabulary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National Yunlin University of Science & Technology
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Test Item
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Course information
Profile
Goal
Virtual Bag
Organization
Self Learning
Review
Organization
Self Learning
Assessment
View Peers
Trace Result
1 /1
80.5%
尋找
小字典工具
列印
閱讀輔助小幫手
新增單字

Member Information
ourse: 超級閱讀高手
tatus: Student
ember: 9841718

Task 2 Science at Your Fingertips

Have you ever been to a fortune-teller who could tell you personality and future just by looking at your hand? Did he or she make a lot of dire predictions about your future? Or were you promised wealth, happiness, and longevity? You might have thought that this f … ars, but actually he or she ma … just been … n could have b … your fing

The dictionary

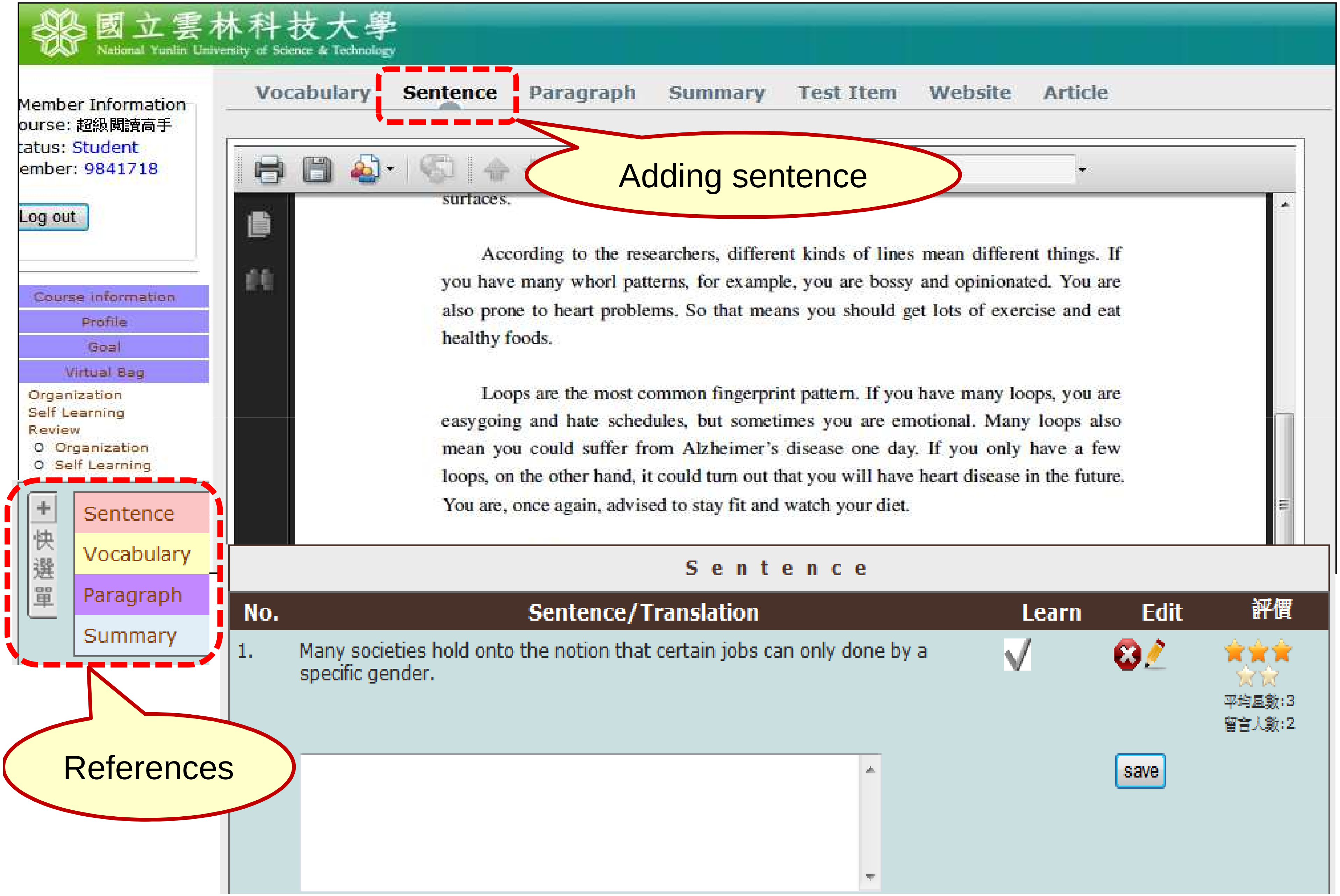
Vocabulary helper

Adding vocabulary

Vocabulary

No.	Vocabulary	Definition	Learned	Edit	More detail	Context	評價
1	arch	a curved structure that supports the weight of something above it, such as a bridge or the upper part of a building拱（支撐如橋梁或房屋上部的弧形結構）	✓	✎ ✖	more	context	☆☆☆☆☆ 平均星數:0 留言人數:0
2	emotional	connected with people's feelings(= with the emotions)感情的；情感的；情緒的usually before noun	✓	✎ ✖	more	context	☆☆☆☆☆ 平均星數:0

In the organization module- Sentence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Sentence
Vocabulary
Paragraph
Summary
save
Adding sentence
References

Member Information
ourse: 超級閱讀高手
tatus: Student
ember: 9841718

surfaces.

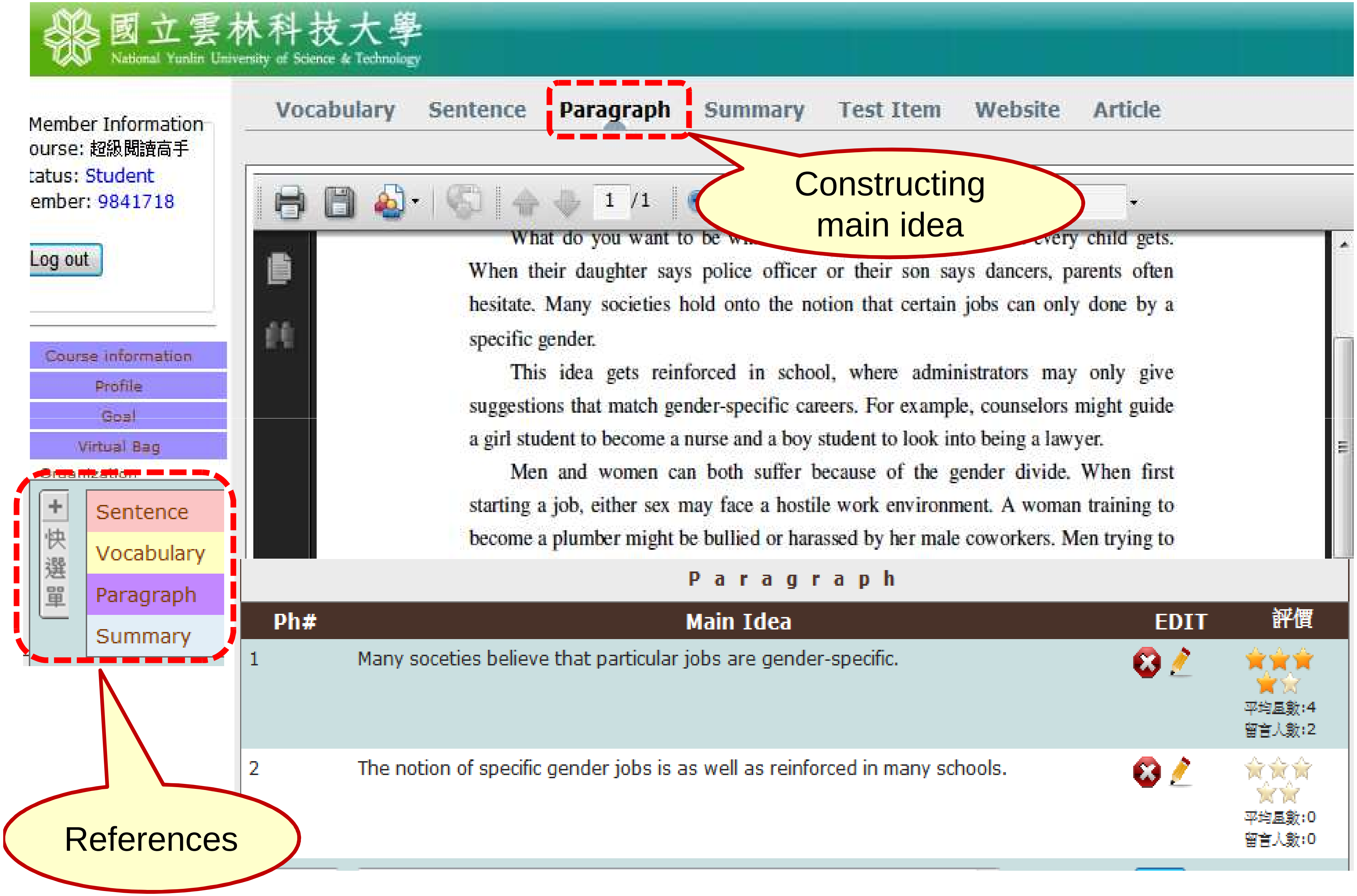
According to the researchers, different kinds of lines mean different things. If you have many whorl patterns, for example, you are bossy and opinionated. You are also prone to heart problems. So that means you should get lots of exercise and eat healthy foods.

Loops are the most common fingerprint pattern. If you have many loops, you are easygoing and hate schedules, but sometimes you are emotional. Many loops also mean you could suffer from Alzheimer's disease one day. If you only have a few loops, on the other hand, it could turn out that you will have heart disease in the future. You are, once again, advised to stay fit and watch your diet.

Sentence

No.	Sentence/Translation	Learn	Edit	評價
1.	Many societies hold onto the notion that certain jobs can only done by a specific gender.	✓	☒ ✎	★★★☆☆ 平均星數:3 留言人數:2

In the organization module- Main idea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What do you want to be w every child gets. When their daughter says police officer or their son says dancers, parents often hesitate. Many societies hold onto the notion that certain jobs can only done by a specific gender.

This idea gets reinforced in school, where administrators may only give suggestions that match gender-specific careers. For example, counselors might guide a girl student to become a nurse and a boy student to look into being a lawyer.

Men and women can both suffer because of the gender divide. When first starting a job, either sex may face a hostile work environment. A woman training to become a plumber might be bullied or harassed by her male coworkers. Men trying to

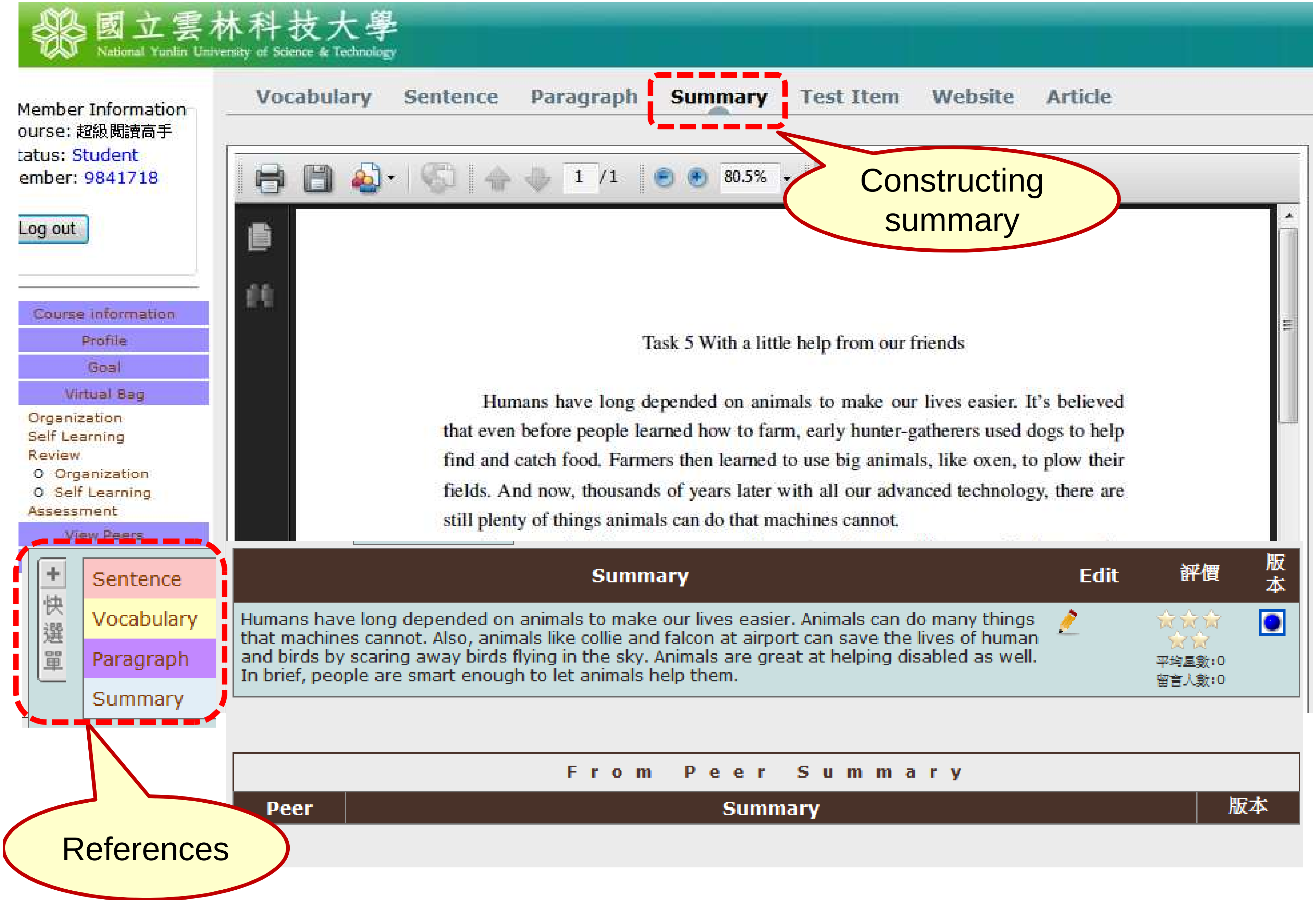
Paragraph

Ph#	Main Idea	EDIT	評價
1	Many soceties believe that particular jobs are gender-specific.		平均星數:4 留言人數:2
2	The notion of specific gender jobs is as well as reinforced in many schools.		平均星數:0 留言人數:0

Constructing main idea

References

In the organization module- **Summary**



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快選單
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Paragraph
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Task 5 With a little help from our friends

Humans have long depended on animals to make our lives easier. It's believed that even before people learned how to farm, early hunter-gatherers used dogs to help find and catch food. Farmers then learned to use big animals, like oxen, to plow their fields. And now, thousands of years later with all our advanced technology, there are still plenty of things animals can do that machines cannot.

Summary	Edit	評價	版本
Humans have long depended on animals to make our lives easier. Animals can do many things that machines cannot. Also, animals like collie and falcon at airport can save the lives of human and birds by scaring away birds flying in the sky. Animals are great at helping disabled as well. In brief, people are smart enough to let animals help them.	✎	☆☆☆☆☆ 平均星數:0 留言人數:0	◉

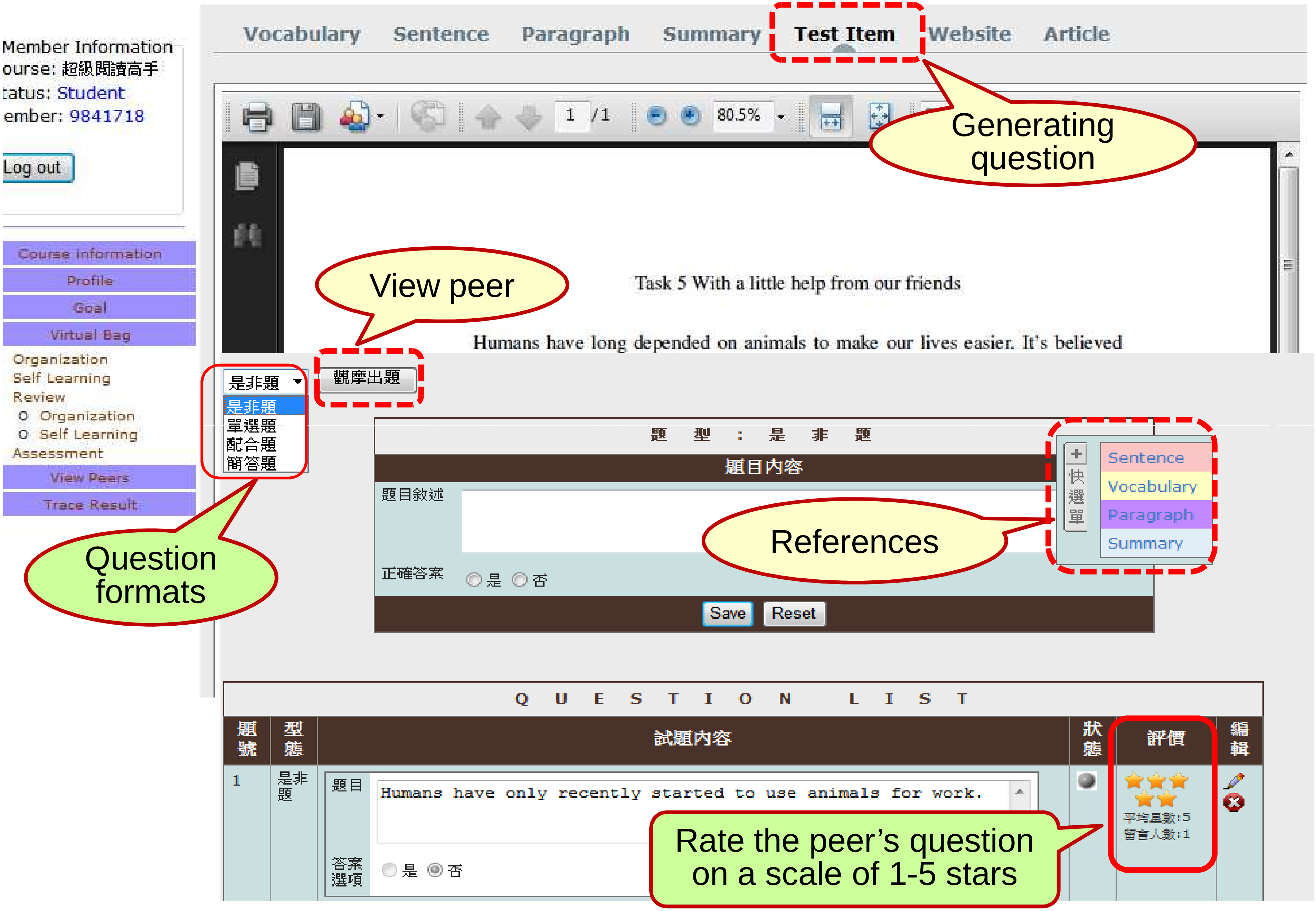
From Peer Summary

Peer	Summary	版本

Constructing summary

References

In the composing module- Question generation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Trace Result
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是非題
單選題
配合題
簡答題
觀摩出題
+
快選單
Sentence
Vocabulary
Paragraph
Summary
Save
Reset

Member Information
ourse: 超級閱讀高手
tatus: Student
ember: 9841718

Task 5 With a little help from our friends

Humans have long depended on animals to make our lives easier. It's believed

題型：是非題

題目內容

題目敘述

正確答案 ○ 是 ○ 否

QUESTION LIST

題號	型態	試題內容		狀態	評價	編輯
1	是非題	題目	Humans have only recently started to use animals for work.	●	★★★★★ 平均星數:5 留言人數:1	
		答案選項	○ 是 ● 否			

Generating question

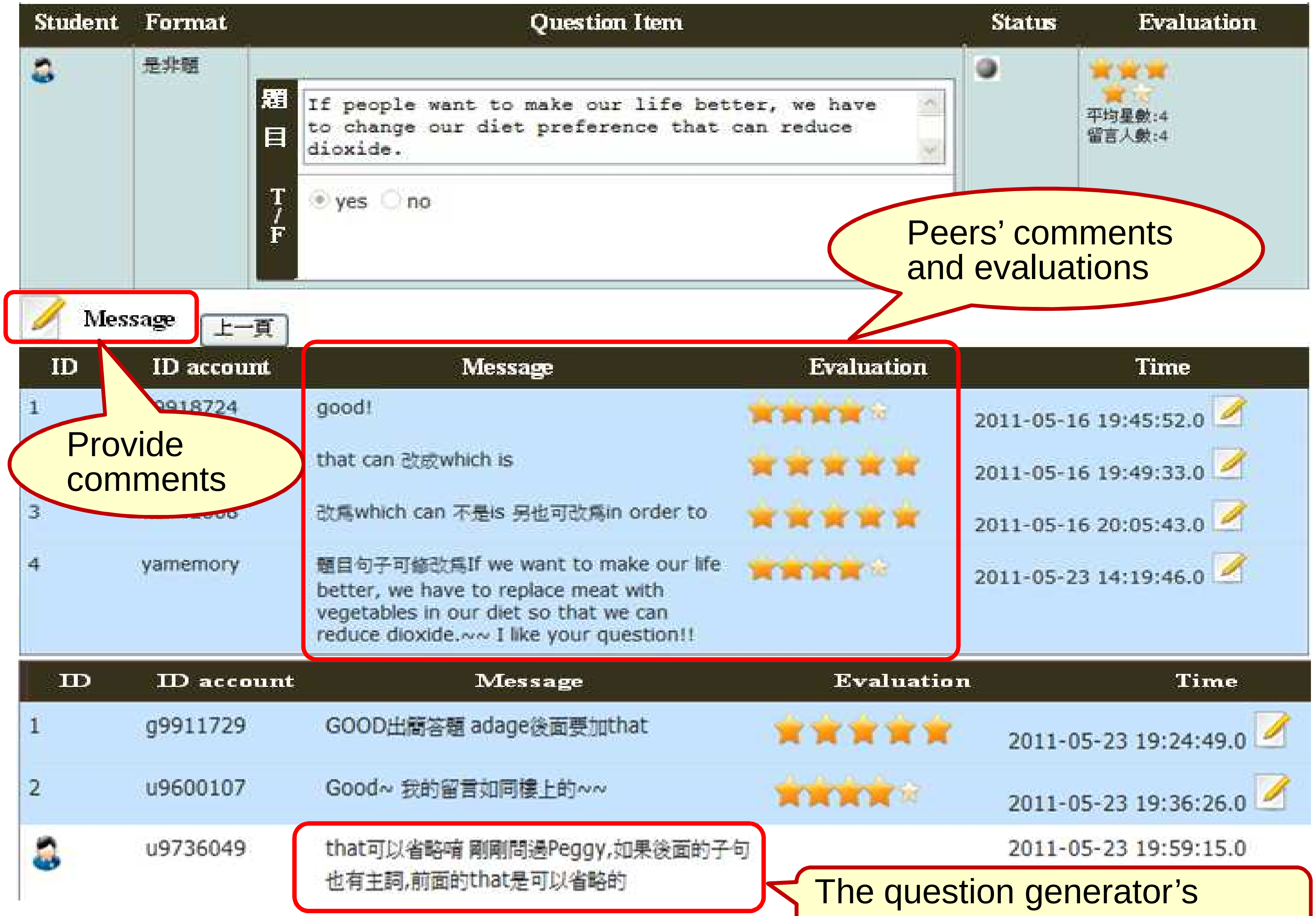
View peer

Question formats

References

Rate the peer's question on a scale of 1-5 stars

In the peer assessment module- Peer Assessment



Student	Format	Question Item	Status	Evaluation
	是非題	題目: If people want to make our life better, we have to change our diet preference that can reduce dioxide. T/F: ● yes ○ no	●	★★★★☆ 平均星數:4 留言人數:4

ID	ID account	Message	Evaluation	Time
1	9918724	good!	★★★★☆	2011-05-16 19:45:52.0
		that can 改成which is	★★★★★	2011-05-16 19:49:33.0
3		改為which can 不是is 另也可改為in order to	★★★★★	2011-05-16 20:05:43.0
4	yamemory	題目句子可修改為If we want to make our life better, we have to replace meat with vegetables in our diet so that we can reduce dioxide.~~ I like your question!!	★★★★☆	2011-05-23 14:19:46.0

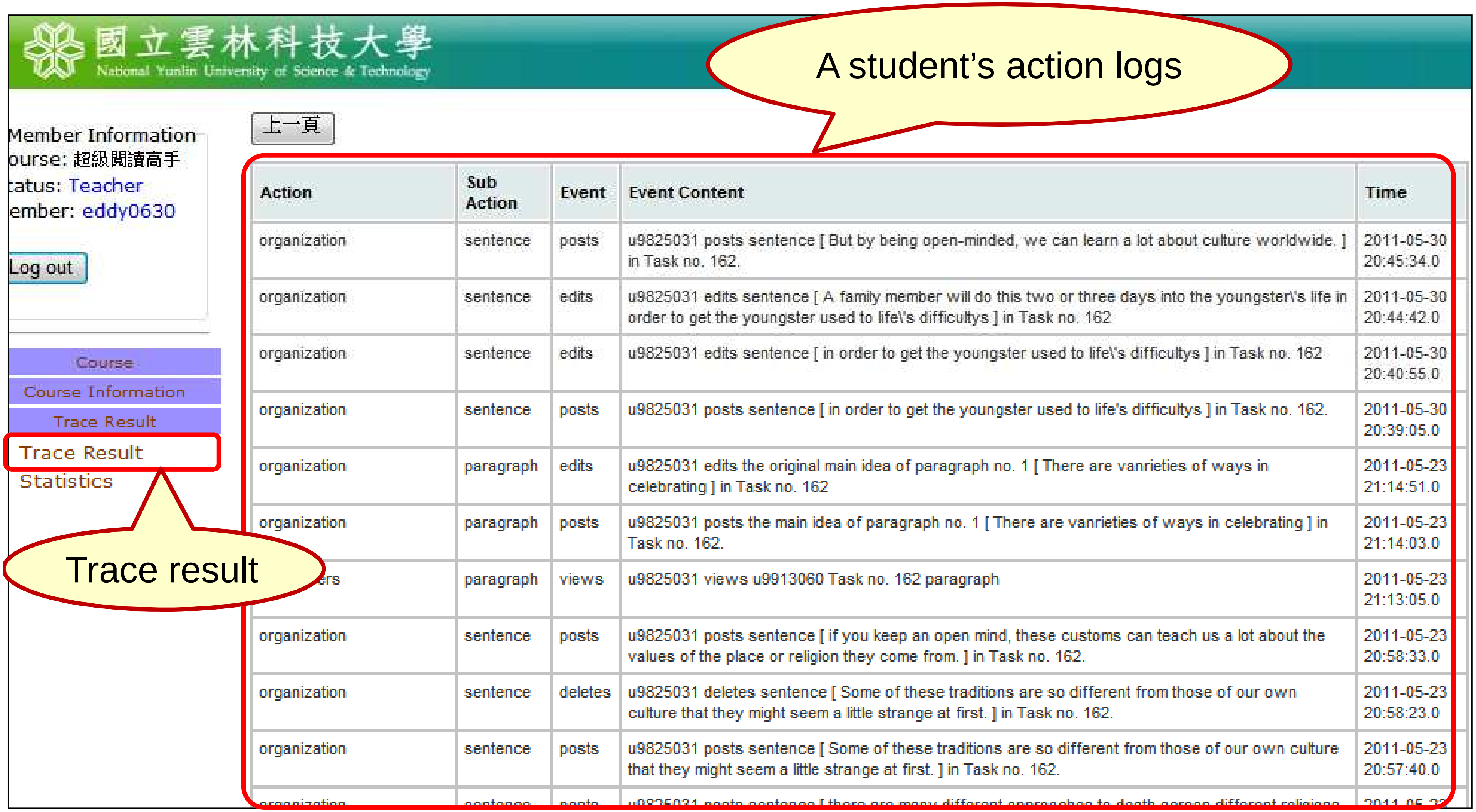
ID	ID account	Message	Evaluation	Time
1	g9911729	GOOD出簡答題 adage後面要加that	★★★★★	2011-05-23 19:24:49.0
2	u9600107	Good~ 我的留言如同樓上的~~	★★★★☆	2011-05-23 19:36:26.0
	u9736049	that可以省略唷 剛剛問過Peggy,如果後面的子句也有主詞,前面的that是可以省略的		2011-05-23 19:59:15.0

Peers' comments and evaluations

Provide comments

The question generator's responses to peers' comments

The teacher interface- Students’ action logs

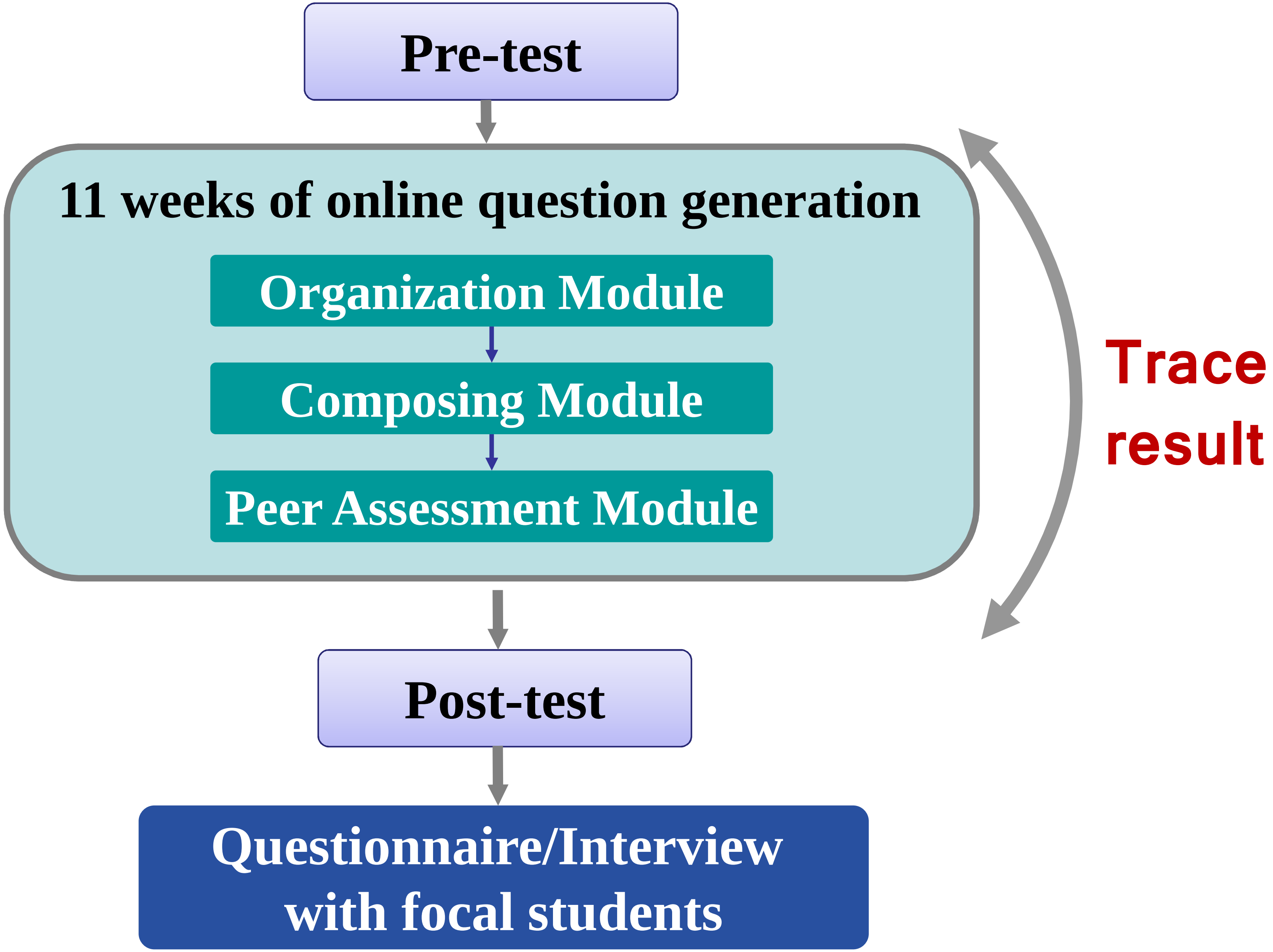


A student’s action logs

Trace result

Action	Sub Action	Event	Event Content	Time
organization	sentence	posts	u9825031 posts sentence [But by being open-minded, we can learn a lot about culture worldwide.] in Task no. 162.	2011-05-30 20:45:34.0
organization	sentence	edits	u9825031 edits sentence [A family member will do this two or three days into the youngster\'s life in order to get the youngster used to life\'s difficultys] in Task no. 162	2011-05-30 20:44:42.0
organization	sentence	edits	u9825031 edits sentence [in order to get the youngster used to life\'s difficultys] in Task no. 162	2011-05-30 20:40:55.0
organization	sentence	posts	u9825031 posts sentence [in order to get the youngster used to life's difficultys] in Task no. 162.	2011-05-30 20:39:05.0
organization	paragraph	edits	u9825031 edits the original main idea of paragraph no. 1 [There are vanrieties of ways in celebrating] in Task no. 162	2011-05-23 21:14:51.0
organization	paragraph	posts	u9825031 posts the main idea of paragraph no. 1 [There are vanrieties of ways in celebrating] in Task no. 162.	2011-05-23 21:14:03.0
ers	paragraph	views	u9825031 views u9913060 Task no. 162 paragraph	2011-05-23 21:13:05.0
organization	sentence	posts	u9825031 posts sentence [if you keep an open mind, these customs can teach us a lot about the values of the place or religion they come from.] in Task no. 162.	2011-05-23 20:58:33.0
organization	sentence	deletes	u9825031 deletes sentence [Some of these traditions are so different from those of our own culture that they might seem a little strange at first.] in Task no. 162.	2011-05-23 20:58:23.0
organization	sentence	posts	u9825031 posts sentence [Some of these traditions are so different from those of our own culture that they might seem a little strange at first.] in Task no. 162.	2011-05-23 20:57:40.0
organization	sentence	posts	u9825031 posts sentence [there are many different approaches to death across different religions	2011-05-23

Procedure of Data Collection



Pre-test

11 weeks of online question generation

Organization Module

Composing Module

Peer Assessment Module

Trace result

Post-test

Questionnaire/Interview with focal students

Procedure of Data Analysis

- A t-test: to examine students’ reading comprehension improvement in the pre-test and the post-test simulated TOEIC exam through SPSS 12.0.
- Students’ action logs: to explored how students generated exam questions, how they interacted with peers, and how they took actions to revise their questions.
- The semi-structured interviews: to know why the students took some actions in the question generation processes.

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- Introduction
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Results

Question 1 :

To what extent was students' reading comprehension improved after implementing online question generation?

Question 2 :

What processes were involved in students' online question generation that affected their reading comprehension?

Reading comprehension improvement through online question generation

A significant difference (t=6.58, p<.05) between the pre-test (m=276, sd=10.32) and post-test (m=320, sd=7.59) was identified for the MP Group (N=5).

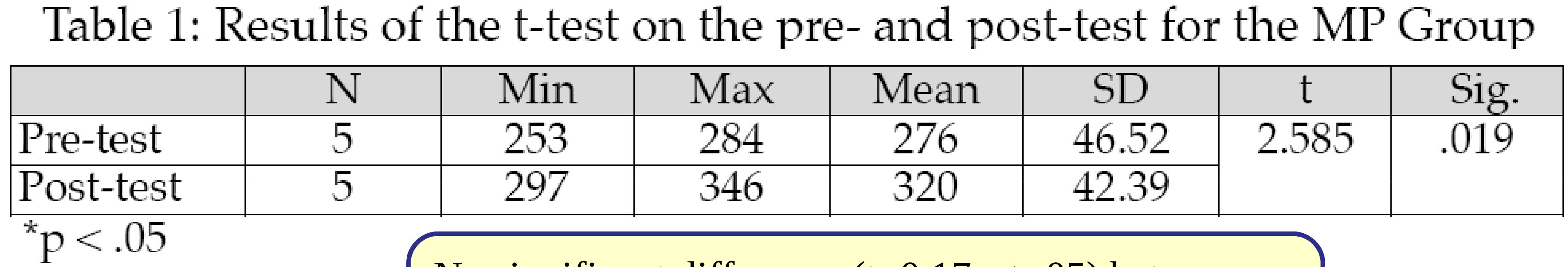


Table 1: Results of the t-test on the pre- and post-test for the MP Group

	N	Min	Max	Mean	SD	t	Sig.
Pre-test	5	253	284	276	46.52	2.585	.019
Post-test	5	297	346	320	42.39		

$^*p < .05$

No significant difference (t=0.17, p>.05) between the pre-test (m=267, sd =15.33) and the post-test (m=281, sd=2.07) for the LP Group (N=4).

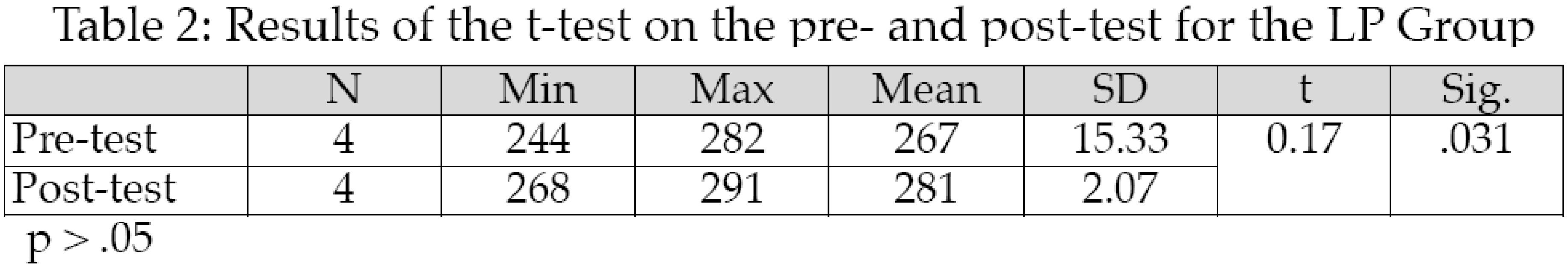


Table 2: Results of the t-test on the pre- and post-test for the LP Group

	N	Min	Max	Mean	SD	t	Sig.
Pre-test	4	244	282	267	15.33	0.17	.031
Post-test	4	268	291	281	2.07		

$p > .05$

Reading comprehension improvement through online question generation

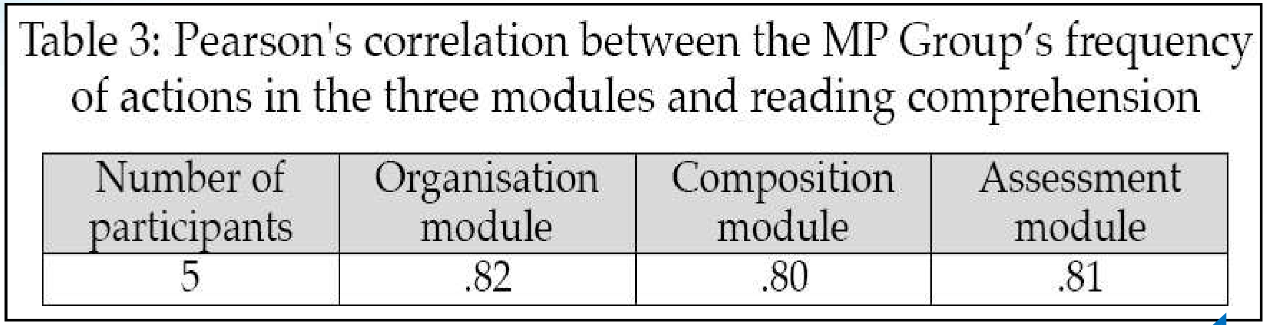


Table 3: Pearson's correlation between the MP Group's frequency of actions in the three modules and reading comprehension

Number of participants	Organisation module	Composition module	Assessment module
5	.82	.80	.81

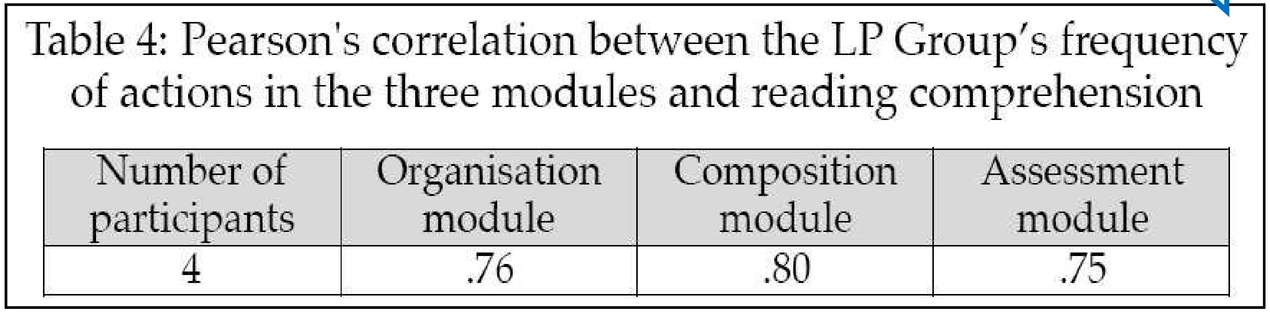


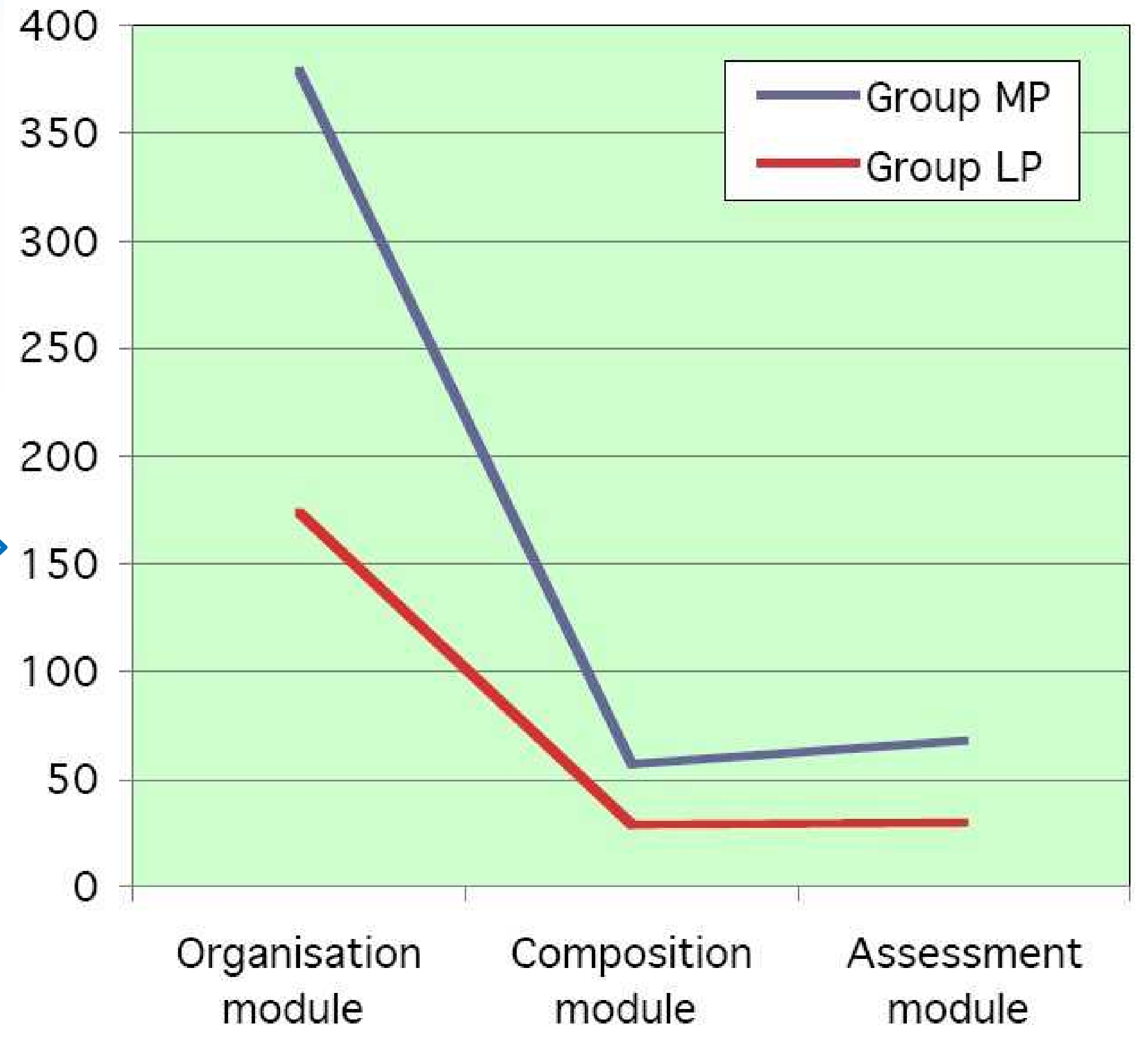
Table 4: Pearson's correlation between the LP Group's frequency of actions in the three modules and reading comprehension

Number of participants	Organisation module	Composition module	Assessment module
4	.76	.80	.75

The results highlighted that the MP Group’s and LP Group’s frequency of actions in online question generation had a positive relationship with their reading comprehension.

Question generation processes in the organization, composition, and peer assessment modules for the MP and LP students

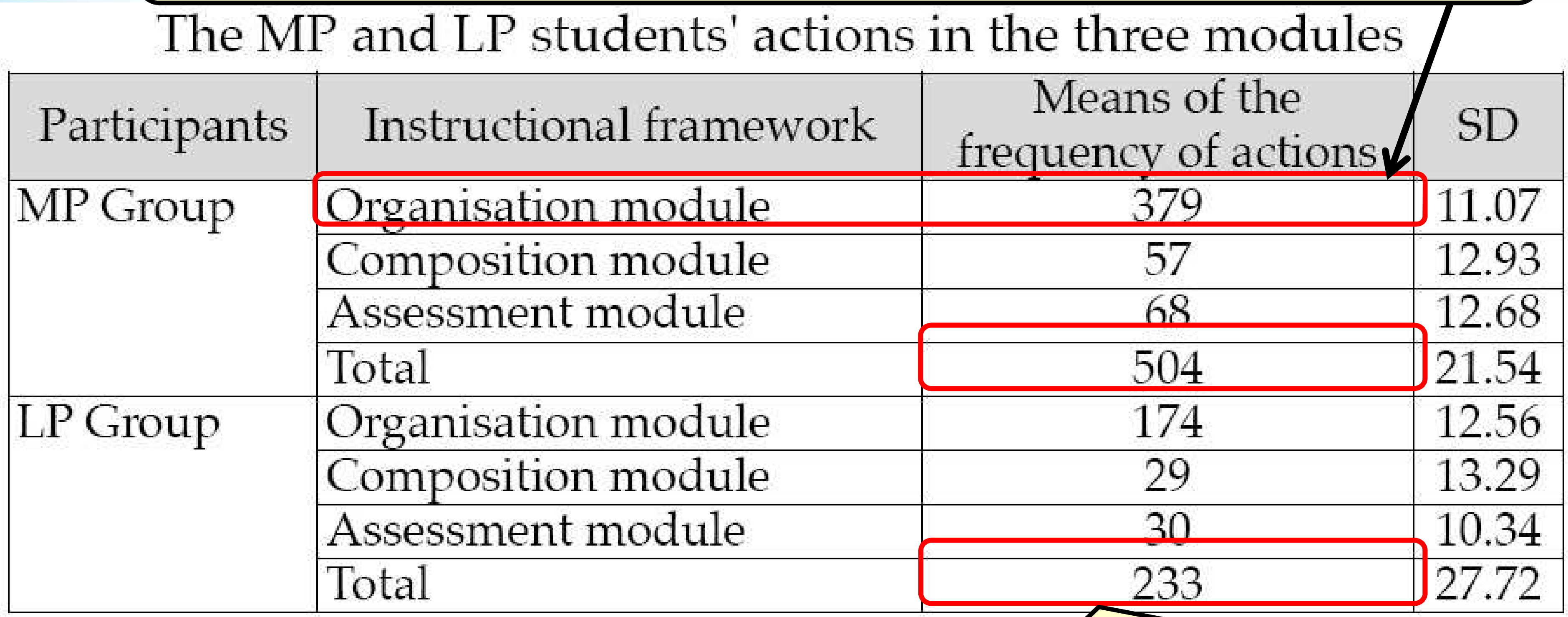
Compared to the LP Group, the MP Group demonstrated almost twice the frequency of actions in each module in the online system.



The MP and LP students' frequency of actions

The more progress (MP) students versus less progress (LP) students

The MP Group was found to have put in much more effort (m=315, sd=11.07) than the LP Group (m=174, sd=12.96) in the organisation module



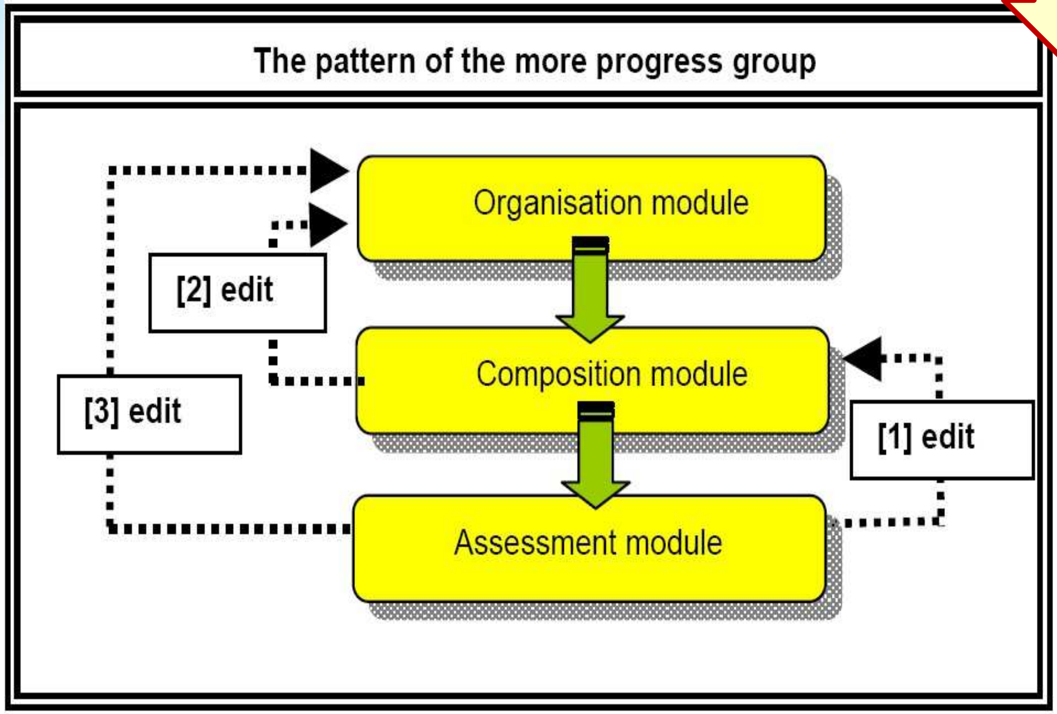
The MP and LP students' actions in the three modules

Participants	Instructional framework	Means of the frequency of actions	SD
MP Group	Organisation module	379	11.07
	Composition module	57	12.93
	Assessment module	68	12.68
	Total	504	21.54
LP Group	Organisation module	174	12.56
	Composition module	29	13.29
	Assessment module	30	10.34
	Total	233	27.72

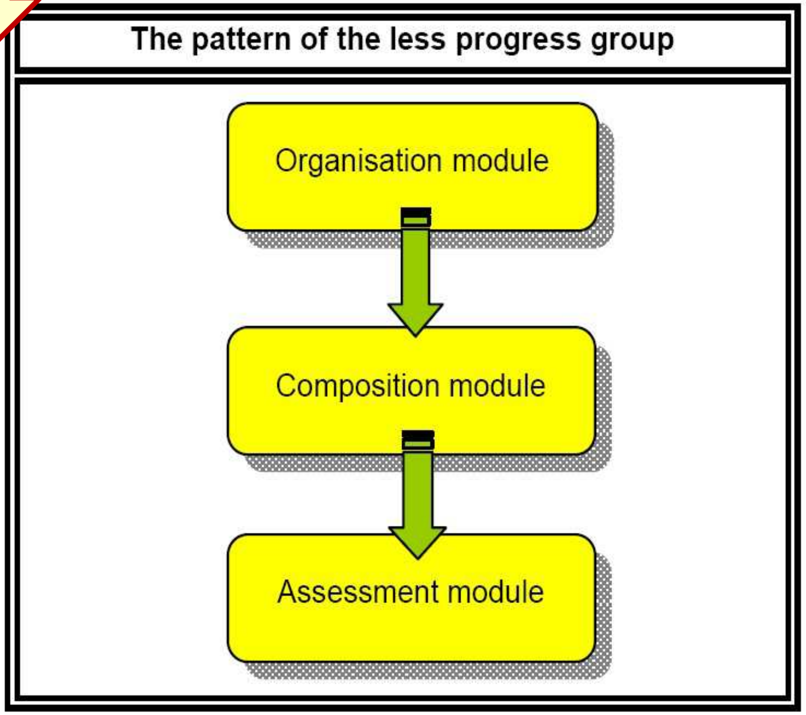
The MP Group was more actively engaged in the online question generation processes than the LP Group.

The more progress (MP) students versus less progress (LP) students

A significant difference between the MP and LP Group was in the action of "editing."


The pattern of the more progress group
Organisation module
[2] edit
Composition module
[3] edit
[1] edit
Assessment module

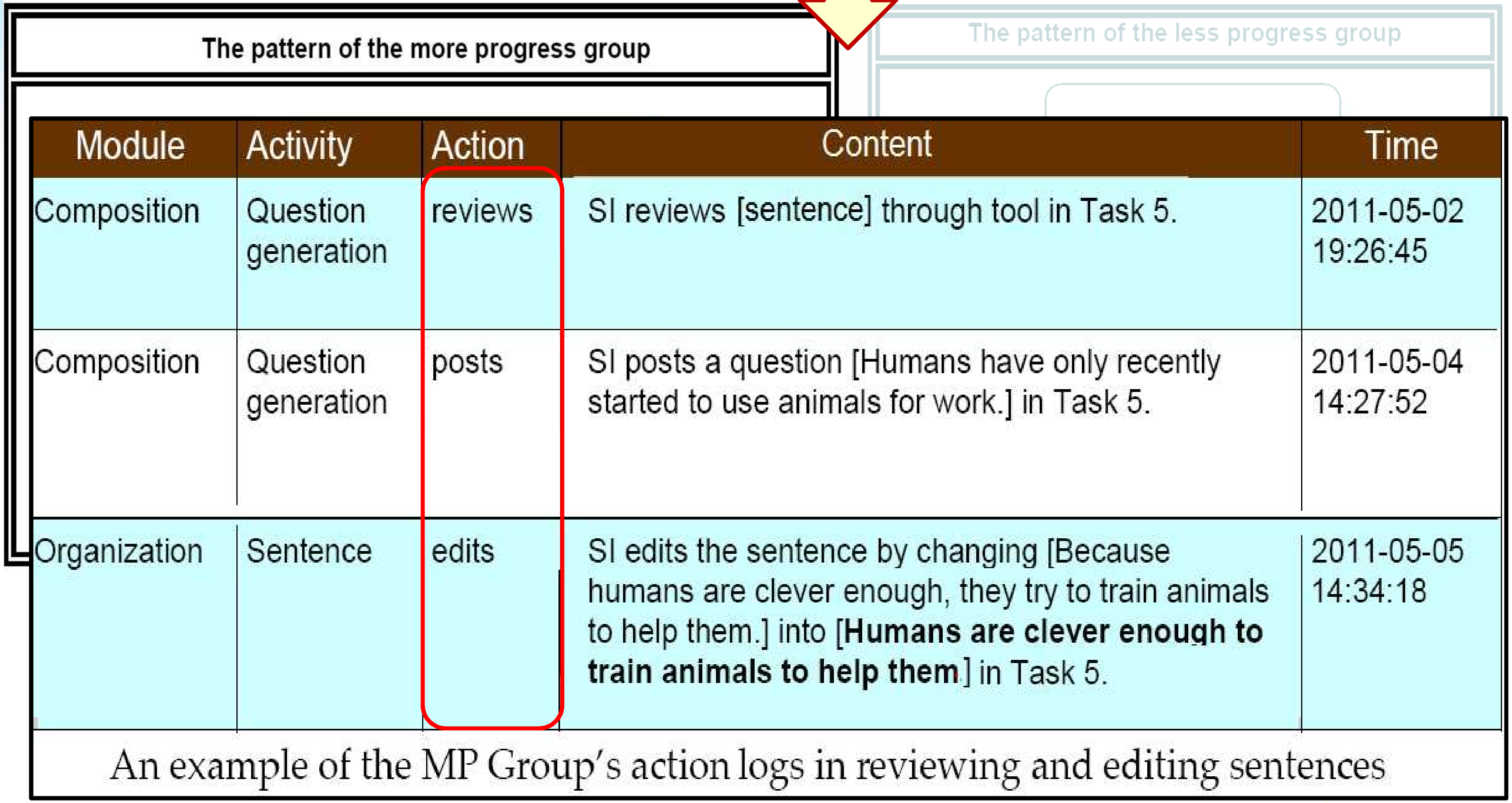
The MP's Group online question generation pattern


The pattern of the less progress group
Organisation module
Composition module
Assessment module

The LP Group's online question generation pattern

The more progress (MP) students versus less progress (LP) students

A significant difference between the MP and LP Group was in the action of "editing."



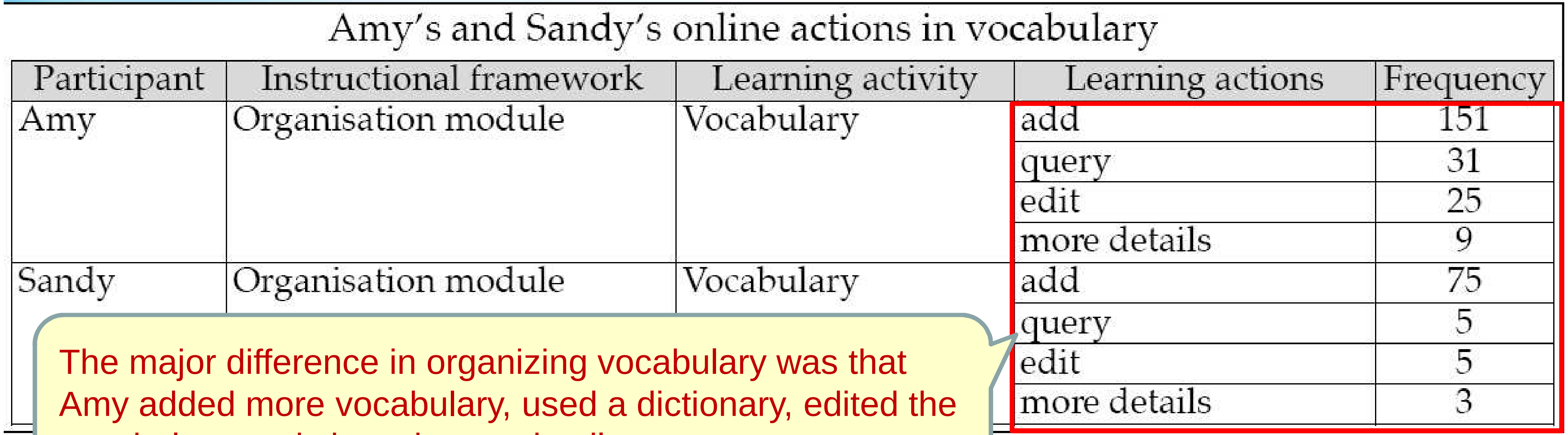
The pattern of the more progress group

The pattern of the less progress group

Module	Activity	Action	Content	Time
Composition	Question generation	reviews	SI reviews [sentence] through tool in Task 5.	2011-05-02 19:26:45
Composition	Question generation	posts	SI posts a question [Humans have only recently started to use animals for work.] in Task 5.	2011-05-04 14:27:52
Organization	Sentence	edits	SI edits the sentence by changing [Because humans are clever enough, they try to train animals to help them.] into [**Humans are clever enough to train animals to help them**] in Task 5.	2011-05-05 14:34:18

An example of the MP Group's action logs in reviewing and editing sentences

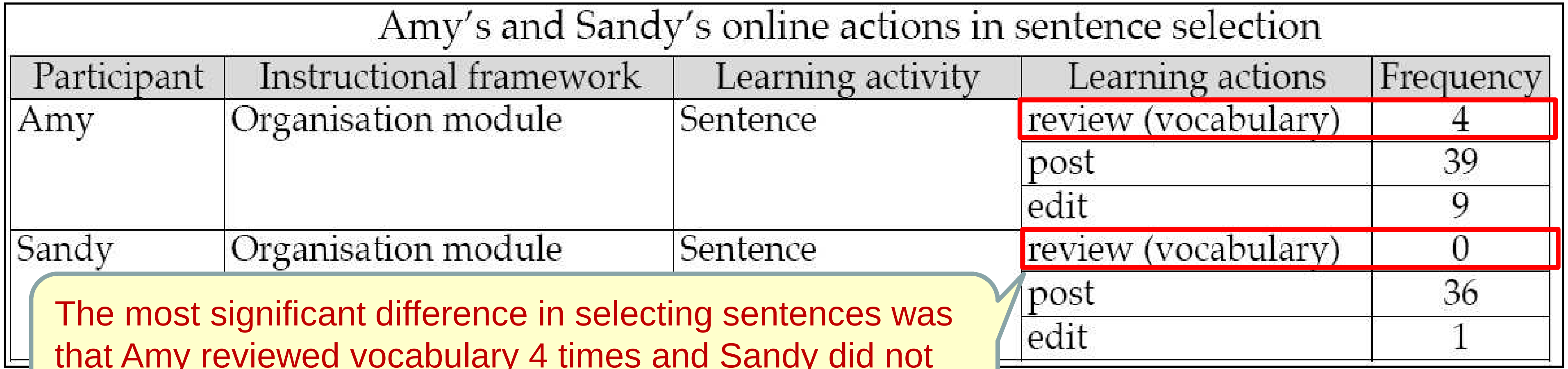
Selected cases from the MP group ('Amy') and the LP group ('Sandy')



Amy's and Sandy's online actions in vocabulary

Participant	Instructional framework	Learning activity	Learning actions	Frequency
Amy	Organisation module	Vocabulary	add	151
			query	31
			edit	25
			more details	9
Sandy	Organisation module	Vocabulary	add	75
			query	5
			edit	5
			more details	3

The major difference in organizing vocabulary was that Amy added more vocabulary, used a dictionary, edited the vocabulary, and viewed more details.

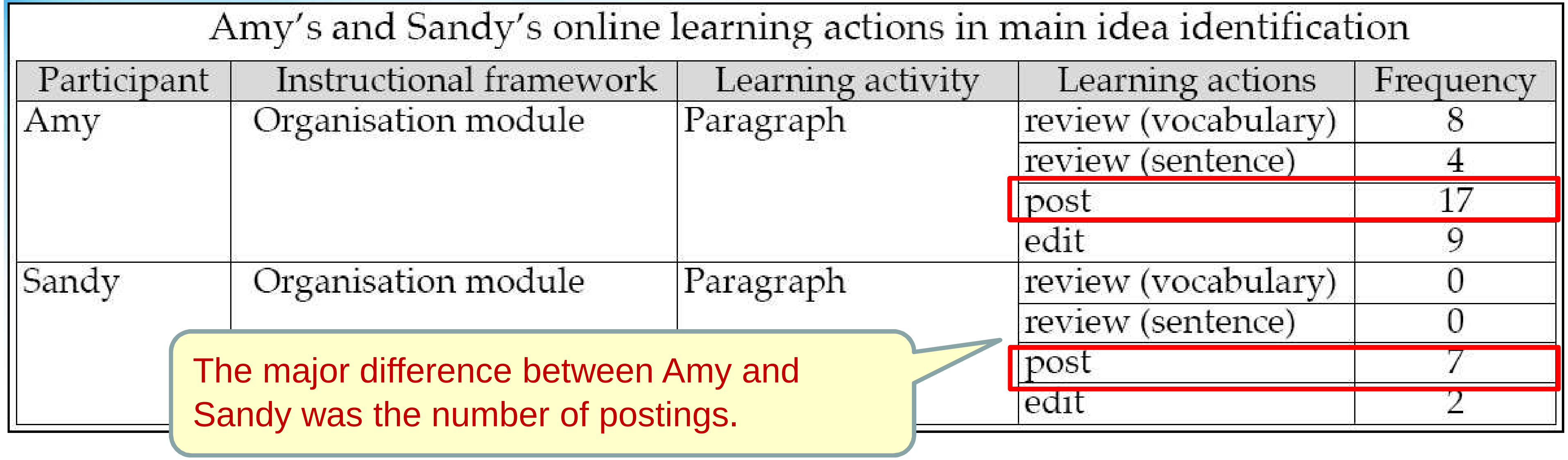


Amy's and Sandy's online actions in sentence selection

Participant	Instructional framework	Learning activity	Learning actions	Frequency
Amy	Organisation module	Sentence	review (vocabulary)	4
			post	39
			edit	9
Sandy	Organisation module	Sentence	review (vocabulary)	0
			post	36
			edit	1

The most significant difference in selecting sentences was that Amy reviewed vocabulary 4 times and Sandy did not review the vocabulary.

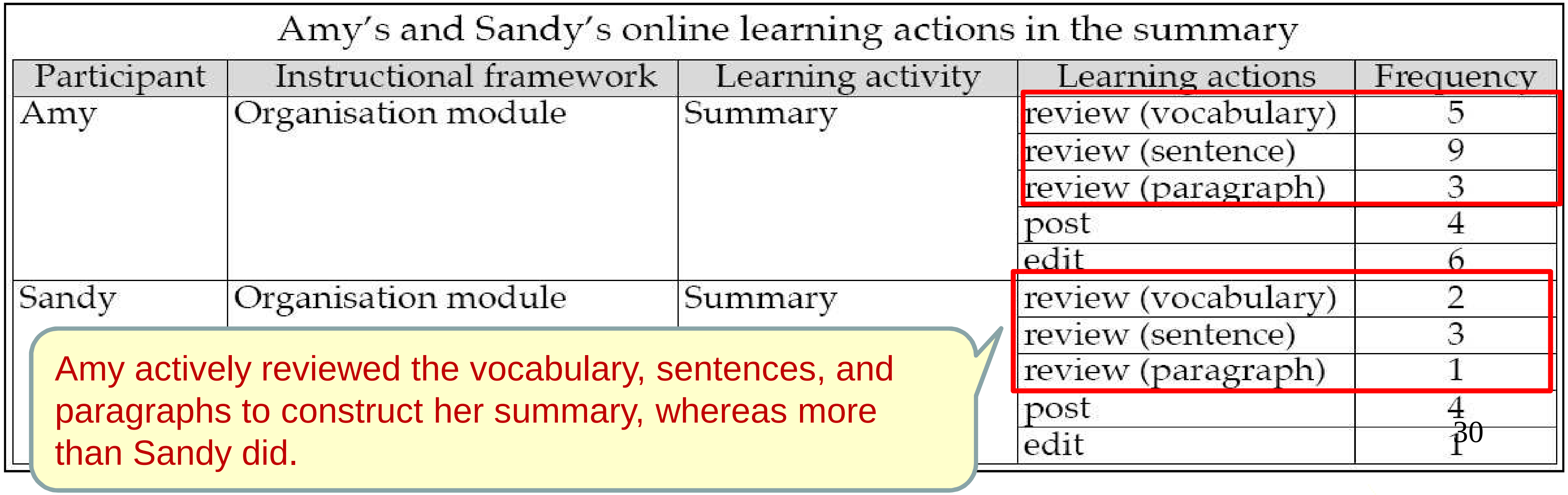
Selected cases from the MP group ('Amy') and the LP group ('Sandy')



Amy's and Sandy's online learning actions in main idea identification

Participant	Instructional framework	Learning activity	Learning actions	Frequency
Amy	Organisation module	Paragraph	review (vocabulary)	8
			review (sentence)	4
			post	17
			edit	9
Sandy	Organisation module	Paragraph	review (vocabulary)	0
			review (sentence)	0
			post	7
			edit	2

The major difference between Amy and Sandy was the number of postings.

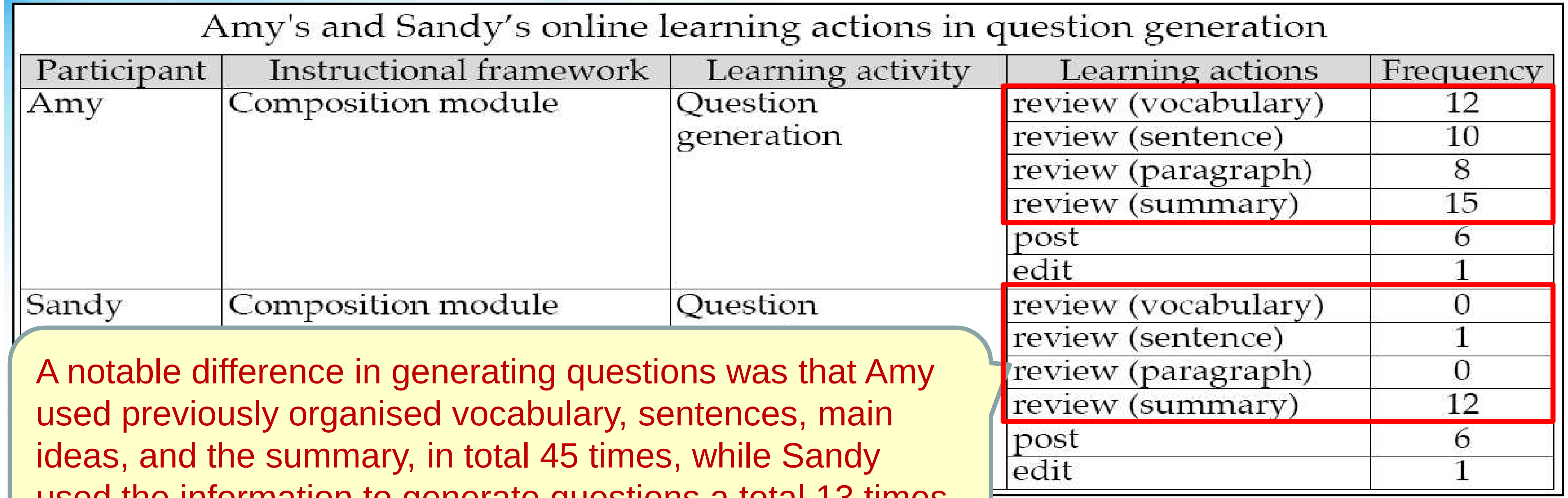


Amy's and Sandy's online learning actions in the summary

Participant	Instructional framework	Learning activity	Learning actions	Frequency
Amy	Organisation module	Summary	review (vocabulary)	5
			review (sentence)	9
			review (paragraph)	3
			post	4
			edit	6
Sandy	Organisation module	Summary	review (vocabulary)	2
			review (sentence)	3
			review (paragraph)	1
			post	4
			edit	1

Amy actively reviewed the vocabulary, sentences, and paragraphs to construct her summary, whereas more than Sandy did.

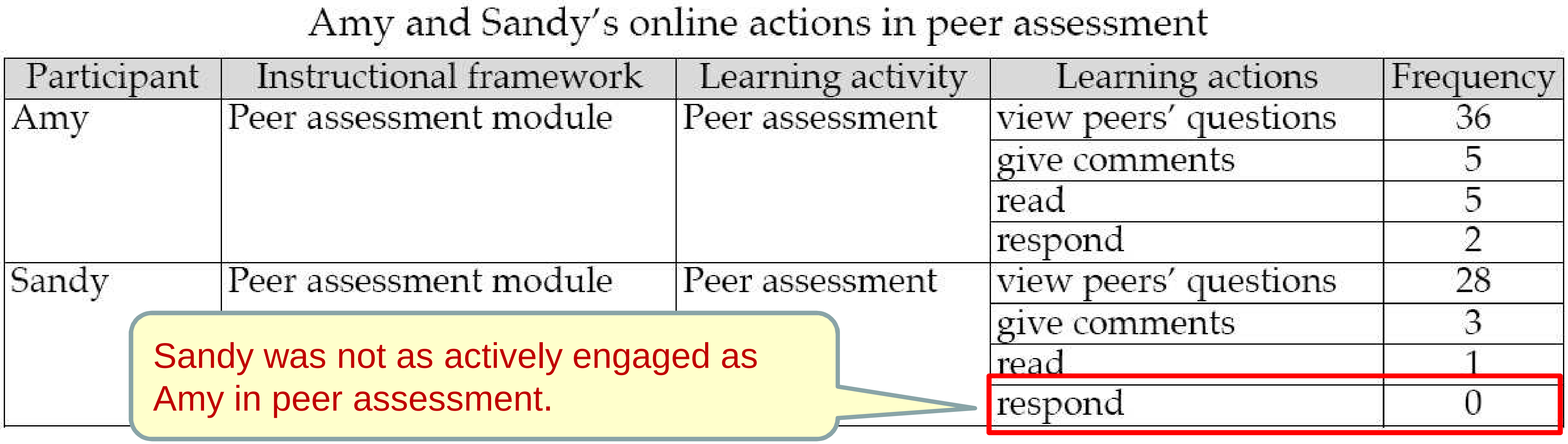
Selected cases from the MP group ('Amy') and the LP group ('Sandy')



Amy's and Sandy's online learning actions in question generation

Participant	Instructional framework	Learning activity	Learning actions	Frequency
Amy	Composition module	Question generation	review (vocabulary)	12
			review (sentence)	10
			review (paragraph)	8
			review (summary)	15
			post	6
			edit	1
Sandy	Composition module	Question	review (vocabulary)	0
			review (sentence)	1
			review (paragraph)	0
			review (summary)	12
			post	6
			edit	1

A notable difference in generating questions was that Amy used previously organised vocabulary, sentences, main ideas, and the summary, in total 45 times, while Sandy used the information to generate questions a total 13 times.



Amy and Sandy's online actions in peer assessment

Participant	Instructional framework	Learning activity	Learning actions	Frequency
Amy	Peer assessment module	Peer assessment	view peers' questions	36
			give comments	5
			read	5
			respond	2
Sandy	Peer assessment module	Peer assessment	view peers' questions	28
			give comments	3
			read	1
			respond	0

Sandy was not as actively engaged as Amy in peer assessment.

Outline

- Introduction
- Literature Review
- Methodology
- Results
- Discussion

Discussion

Q1: To what extent was students' reading comprehension improved after implementing online question generation?

- The result of the t-test showed that there was a significant difference in students' reading comprehension improvement after implementing the online question generation system..
- The finding was in line with previous studies which suggest that question generation can enhance the level of understanding of the reading materials (Barak & Rafaeli, 2004; Belanich, Wisher & Orvis, 2005; Cohen, 1983; Dreher & Gambrell, 1985; Yu & Liu, 2005; Yu, Liu & Chan, 2005).

Discussion

Q2: What processes were involved in students' online question generation that affected their reading comprehension?

- In the organisation module, the results showed that the MP Group engaged in a higher frequency of editing their previously organised vocabulary, sentences, main ideas, and summaries.

Such findings might imply that the MP Group was equipped with a higher level of metacognitive skill to monitor the question generation processes by retrieving related information, and take remedial actions to revise the previously organised vocabulary, sentences, main ideas, and summaries.

The review of the previously organised information while generating questions was helpful in enhancing students' reading comprehension.

- In the composition module, the MP Group had a higher frequency in reviewing the previously organised information to generate online questions.
- In the peer assessment module, the MP Group demonstrated greater involvement in undertaking peer assessment.

Allowing students to read their peers' questions and answers is effective in encouraging students to reread the texts and re-examine their understanding, especially when students disagree with their peers on the questions and answers.

Discussion

Q2: What processes were involved in students' online question generation that affected their reading comprehension?

- From Amy's action logs, she added vocabulary into her vocabulary databases and edited the previously organised vocabulary by adding synonyms or phrases to expand her vocabulary knowledge. Thus, the improvements in Amy's vocabulary knowledge might be a factor that led to her progress in reading comprehension.

These findings are in agreement with the results of previous studies which indicated that breadth and depth of vocabulary knowledge is essential for students to better comprehend a text (Mehrpour & Rahimi, 2010; Qian, 2002).

- Amy edited the previously organised vocabulary, sentences, main ideas, and summaries more frequently. That is, the students who made progress in the post-test usually monitored their comprehension and took action to revise the information they previously organised.

The results indicate that in the question generation processes, when students continuously monitored, evaluated and self-regulated their reading (Wong, 1985), their reading comprehension could be enhanced.

Discussion

Q2: What processes were involved in students' online question generation that affected their reading comprehension?

- In composition module, Amy made more progress in her reading comprehension and had a higher frequency than Sandy in reviewing the previously organised information to generate online questions. From Amy's action logs and interview data, we learned that she not only reviewed previously organised information, but also reviewed the text and verified her understanding to generate questions.

The findings suggest that generating questions from a text facilitates students to activate their prior knowledge, and connect it to the text (Miciano, 2002; Wong, 1985), and also engages them in a deeper processing of text material (Craig & Lockhart, 1972).

Discussion

Q2: What processes were involved in students' online question generation that affected their reading comprehension?

- In peer assessment module, Amy demonstrated that she was more engaged in the processes of peer assessment than Sandy. This finding suggests that the peer assessment module plays a pivotal role in improving students' reading comprehension through online question generation. In addition, Amy was much more actively engaged in viewing peers' questions, providing comments on peers' questions, and reading and responding to peers' comments. The results showed that students gained greater understanding and retention of the text when they actively engage in peer review in their question generation processes.

It echoed the findings in Belanich, Wisher and Orvis (2005) as well as Yu, Liu and Chan (2005), in that peer assessment in the question generation processes served as the stimulus for students to revisit the texts and evaluate their understanding, when they were not sure of the appropriateness and the correctness of the answers generated by their peers.

Pedagogical Implications

- Teachers should encourage students to generate questions from those tasks designed in the three modules.
- Students assume the roles of question designers who are engaged in a high level of cognitive function to test their peers' understanding and in using their self-regulatory cognitive strategy (Palincsar & Brown, 1984)
- Question generation can be deemed as both summative and formative assessment to examine students' reading comprehension and reading processes.

Suggestions for Future Research

- The sample size is relatively small (nineteen students).so that the findings obtained through the online question generation system might not be assuredly generalised.

- Further studies could look into the relationship between the organisation, composition, and peer assessment processes involved in question generation.

Thank you
for your listening!

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