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POPULARITY OF VARIOUS TEACHING METHODS IN A POST-SECONDARY BIOLOGY CLASS OF A MALAYSIAN PRIVATE INSTITUTION

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Abstract

This study aims to explore the popularity level of various teaching methods in a post-secondary Biology class of a Malaysian private institution. In a large class setting, the three teaching methods used in this study include animations, role play/kinesthetic and group discussion. The form of this study is quantitative response. Respondents are 63 Biology students enrolled in the Foundation in Science course at a local private institution during January 2012 in their final semester. Half of the topics in this subject (nine out of 18 topics), namely recombinant DNA technology and RNA transcription and translation processes were not taught before at secondary level. The quantitative data concerning popularity of the teaching methods whereby 1 is least popular and 5 most popular, were collected and analyzed using XLSTAT Version 2013.2.07. Results indicate that watching animation is the most popular method with highest number of respondents at 47.6% reporting a rating score of 5. Whereas, both group discussion and role play/kinesthetic methods report the same rating score of 4 with highest number of respondents at 39.7% and 38.9% respectively. Two-tailed t-test for two independent samples show that there is significant difference (α=0.05) in the rating score between animation and role play/kinesthetic method as well as animation and group discussion. Findings from this study imply that in-class activities do bring positive learning attitude. However, the activities should be

well-planned and student learning profile assessed for effective student-centered learning at post-secondary education.

Keywords: Post-secondary; Malaysia; Biology new concepts; Teaching methods; Student feedback

INTRODUCTION

The recent Programme for International Student Assessment (PISA) 2012 results showed that Malaysian students fared below average for Mathematics, Reading and Science (Anonymous a, 2014). This result serves as a push factor for the government to make concerted efforts to improve the competency of the students at all levels. One example is the release of Malaysia Education Blueprint 2013-2025 (Anonymous b, 2012). It highlights teacher coaching in Science as one of the key transformation plans. In view of this, science educators at all education levels are being challenged to maintain high standard in their role. They have to be equipped in knowledge and well-trained in the content delivery to ensure the quality of our future science students. As such, research on teaching methods for science education in Malaysia continues to remain at the fore front (Osman, Halim, & Meerah, 2006).

In the context of Malaysian secondary education, the teaching method commonly used is teacher-oriented. This conclusion was drawn from a local study conducted by selected secondary schools in the northern region of Peninsular Malaysia, which reported 58.33% of the teachers responded that there was minimal interaction between teacher-student during class(Saleh & Aziz, 2012). The communication was one-way interaction. Results from this study also showed that 100% of the teachers stated that their teaching was based on their (teacher's) own experience which is teacher-centered.

When students enter into higher education, the main obstacle that they would face is the switch from teacher-centered to student-centered learning approach. In student-centered learning, students play an active role in the learning process and takes ownership of their own learning (Baeten, Kyndt, Struyven, & Dochy, 2010). Many teaching approaches that focus on students' activity have been developed to help students gain deeper understanding of the content.

As much as activity-based teaching is strongly encouraged in a tertiary setting, the primary mode of delivery would still be traditional lecture. Traditional lecture is very much a passive endeavor where the instructor would give lecture and students would listen and write notes but it remains an essential delivery method in universities (Tomanek & Montplaisir, 2004). It is good in its own ways and is often crucial in laying the framework of subject for students who are first exposed to the subject area. It defines the content to be learned by the student and is cost effective.

In the Foundation in Science course at a Malaysian private institution, the primary mode of delivery adopted is traditional lecture. In one lecture class, there are at least 90 students but not more than 115 students. Depending on the subject, the teaching hours for each lecture class is 2 hours per week. The subject under study is Biology, offered during final semester, January 2012 and the total lecture contact hours with students for each lecturer is 11 hours each week for 14 teaching weeks. For this subject, there were 18 topics to be taught throughout 14 teaching weeks and later assessed during final semester exam. Out of these 18 topics, 9 topics were new to students. The other 9 topics were taught at secondary levels in the Biology curriculum at varying depth. Students found it difficult to grasp the new concepts given the limited lecture hours to cover a range of topics. This is reflected from previous average test results of 18.6/30 marks in January 2011 semester. The difficulty level of the test questions were set according to Bloom's Taxonomy where the number of questions in percentage

categorized under taxonomy level included – Knowledge, 12.5%, Comprehension, 40.6%, Application, 31.3%, and Analysis, 15.6%. Based on this, it can be deduced that most of the test marks lost were attributed to comprehension type of questions.

It is in this context that this study was carried out to find out if teaching and learning in class help students comprehend new Biology concepts. It stands to reason that when students like a certain method of teaching, they comprehend the subject better. We use feedback to measure popularity of the teaching method. We incorporated three teaching methods based on student-centered learning in a large class setting. The research questions that will be addressed here are: (1) How popular is animation, role play/kinesthetic method and group discussion? (2) Is there any difference in popularity level rating score of students being taught using the three teaching methods? Hence, the objectives of this study are: (1) to evaluate the popularity level rating score in each teaching method (2) to determine the difference in popularity level rating score between each teaching method.

METHOD

At the end of the semester during lecture, the instructor posted a question on the board "*Which of the three teaching methods: Animation, Role play/kinesthetic, or Group discussion for the topics recombinant DNA technology and RNA transcription and translation, do you find most interesting and you can learn best from it? State on a piece of paper, the rating score: 1-least popular, 2-not quite popular, 3-popular, 4-quite popular, 5-most popular. Also provide your comments on how to help you learn the subject better in class.*"

The feedback paper was collected from the students at the end of the lecture. The total number of respondents was 63 out of total 96 students.

The three teaching methods applied which include animations, role play/kinesthetic and group discussion aim to help students understand a new and difficult concept (to attain Bloom's Taxonomy level 1 – Knowledge and Taxonomy level 2 – Comprehension). There is only one instructor involved in this investigation that is the first author. The instructor is responsible in administering the intervention. Before the teaching methods were applied, students were first introduced to the new concept by means of lecture using notes from PowerPoint slides. The instructor would explain the fundamentals using traditional lecture method.

STUDY INTERVENTION

Animations

The animations used here were adapted from the main textbook used that was Campbell Biology 9th Edition (Reece et al., 2011). Embedded/external CD animations on relevant topics were provided by the publisher. Most of these animations are flat, two-dimensional (2D) characterizations. They were played during lecture before or after the concept was explained. At least two questions were discussed post-animation.

Role play/kinesthetic

Recombinant DNA technology. The key concepts of this topic include the specificity of the restriction enzyme's recognition site and general procedures in DNA cloning. In recombinant DNA technology, the gene of interest is cloned (made multiple copies) in a host cell via a cloning vector that is the plasmid DNA. To do this, the plasmid DNA needs to be cut at specific recognition/restriction site and inserted with gene of interest. The resulting hybrid that contains the plasmid DNA and gene of interest is called a recombinant DNA. This entire process is called DNA cloning. The learning outcome was to understand about restriction site and how restriction enzyme cuts at the restriction site. The materials involved are newspaper representing genomic DNA that is in the host cell separated from the recombinant DNA, a pair of scissors representing

restriction enzyme, hangers of different colours representing plasmid DNA and gene of interest (insert DNA) (Figure 1 and 2).

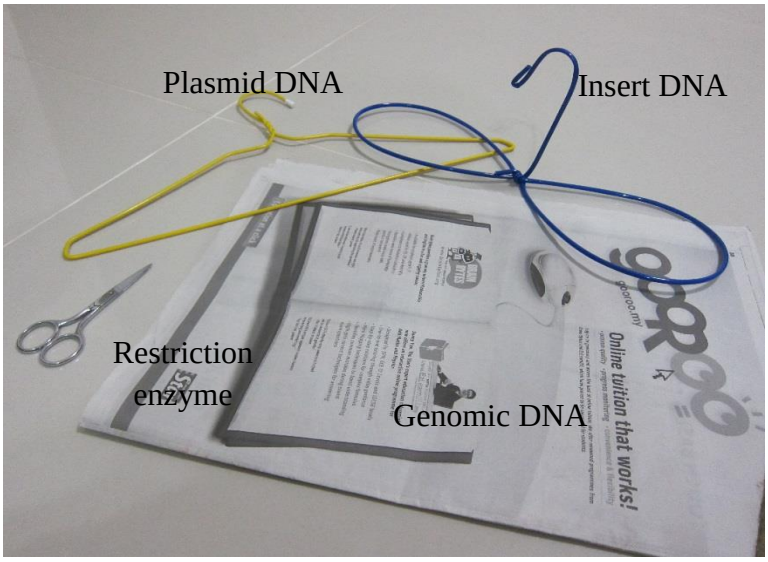

Figure 1. Before recombinant DNA

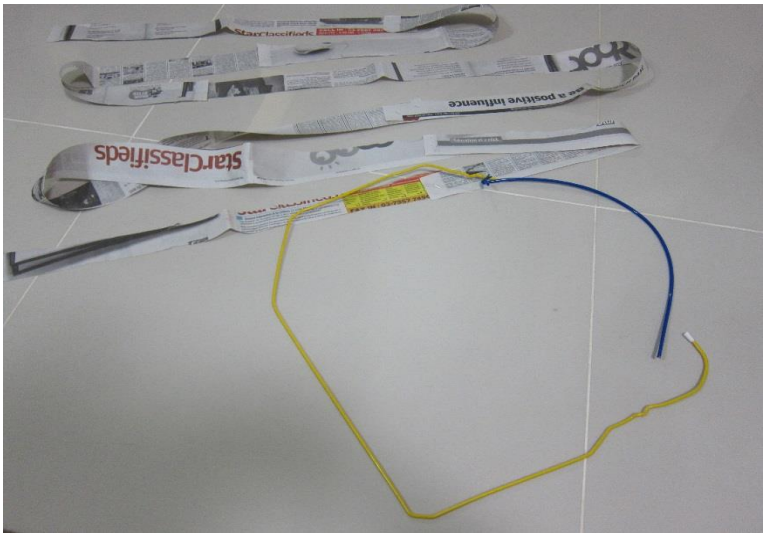

Figure 2. Forming recombinant DNA

How the activity was run is described here. Firs, each student was given a pile of newspaper. They would need to fold the newspaper and cut them into a thread, on which random DNA nucleotide sequences were written. Second, the thread was combined with the student seated next to each other. This was done until a continuous thread with DNA nucleotide sequences

was obtained for the entire class. Lastly, instructions were given to locate a particular restriction site (DNA nucleotide sequences that a restriction enzyme cuts). Once located, student is required to cut. The number of thread pieces was counted at the end of this activity.

RNA translation process. The concept of this topic is that the message (codons) carried by the messenger RNA (mRNA) sequence is translated into amino acid sequence. The anti-codons at transfer RNA (tRNA) play a role in carrying a specific amino acid to the codons. Through a series of complex processes, the amino acid sequence is linked and thus gives rise to polypeptide chain. The objective was to illustrate the concept of RNA translation. The learning outcome was to understand how mRNA is translated into polypeptide chain. The materials involved were RNA nucleotide sequences for codons and anti-codons, template DNA sequence and ribosome were prepared by the instructor in pieces of paper. Students then volunteered themselves to represent each of the item mentioned. The role play starts when students present the entire process of RNA translation using the materials prepared. They need to briefly explain the process. The role play was designed in such a way that a mystery code is represented by the codons and anti-codons to give a secret message. If they illustrated the process of RNA translation correctly, they will be able to find out the secret message.

Group discussion

After breaking the class into small groups, a discussion time of 15 minutes was given to solve a question related to concept taught in the previous lecture. Two groups were asked to volunteer to write answers on the white board, which the rest of the class must comment regardless of the accuracy of the answers.

Recombinant DNA technology. The objective was to find out if students know how to locate restriction sites for a specific restriction enzyme. The difficulty level of the question was Bloom's Taxonomy level 2 – Comprehension. Three different DNA nucleotide sequences (all of the same length that is 21 nucleotides), and an example of restriction enzyme was given. The three

different DNA nucleotide sequences contain at least one restriction site for this specific restriction enzyme. Using the specific restriction enzyme, students were required to identify the number of bands and length of the digested DNA sequences, .

RNA transcription process. The RNA transcription process involves the transcription of DNA nucleotide sequences into mRNA sequences. In this process, the direction of sequence reading (5' to 3' or 3' to 5') is an important concept. RNA is synthesized 5' to 3' from a DNA molecule going 3' to 5'. The objective was to find out if student understands the direction of sequence reading during RNA transcription. The difficulty level of the question was Bloom's Taxonomy level 2 – Comprehension. Students were required to draw RNA transcription process on the whiteboard, for three different genes. In the drawing, the following items were labeled: a) double stranded DNA, b) template DNA, c) direction of sequence reading (5' → 3' or 3' → 5'), and d) gene number.

DATA COLLECTION

At the end of the semester (week 14), students were asked to indicate the popularity of the teaching methods, by a five point Likert scale (1 = least popular, 5 = most popular). The number of respondents was 63. Feedback was collected on the spot and data was analyzed immediately after that.

DATA ANALYSIS

XLSTAT Version 2013.2.07 was used for data analysis. A one sample t-test was conducted on the rating scores to determine if the population mean is significantly different from 3. The test value of 3 is chosen because a value less than 3 implies a less popular teaching method, and a rating of greater than 3 implies a more popular teaching method. The alpha value of 0.05 is chosen to test for significance level.

A two sample t-test was conducted on the rating scores to determine if the population mean in teaching method A is significantly different from that of teaching method B. The alpha value of 0.05 is chosen to test for significance level.

RESULTS

First, responses on which teaching methods is most preferred in better comprehension of new Biology topics, were collected and tabulated in Table 1 and represented in Figure 3. Results show that students prefer to learn the subject through animation method the most, followed by role play/kinesthetic and least prefer group discussion.

Table 1. Rating score of three teaching methods collected from 63 Biology students

No.	Teaching method	Highest rating score given by greatest number of students	Number of respondents who gave the highest rating score	% respondents who gave the highest rating score	Mean	Standard Deviation	Standard Error of the Mean
1	Animation	5	30.0	47.6	4.333	0.735	0.093
2	Role play/kinesthetic	4	24.5	38.9	3.585	0.819	0.104
3	Group discussion	4	25.0	39.7	3.385	0.902	0.115

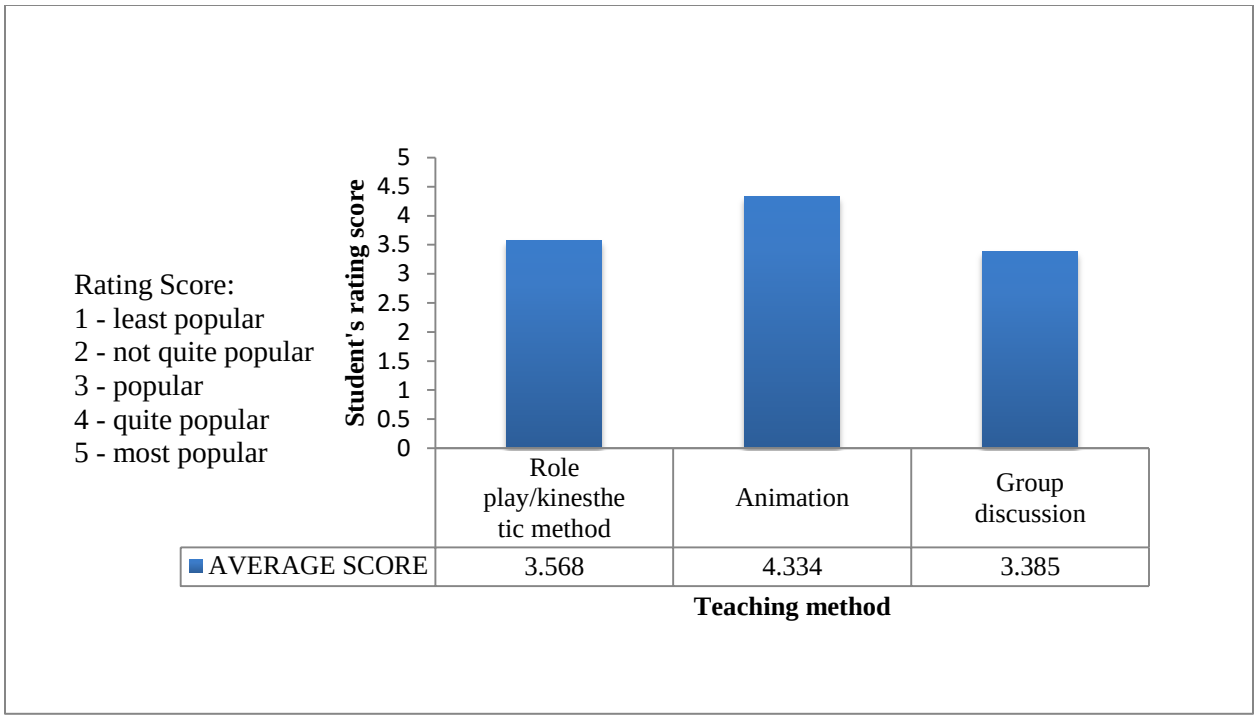

Figure 3. Average rating score of three teaching methods collected from 63 Biology students

Second, we would like to evaluate the popularity level in each teaching method. To reach this objective, we test how different is the student's rating score from that of the reference rating score 3.

H_o: There is no statistical significant difference in the student rating score from the rating score of 3 in each of the teaching method.

H_1 (two-tailed hypothesis): There is a statistical significant difference in the student rating score from the rating score of 3 in each of the teaching method.

To test this hypothesis, one sample t-test was carried out. Results were tabulated in Table 2. As shown in Table 2, there is statistical difference between the student's rating score and reference rating score of 3 in each of the teaching method. This suggests that students appreciate all three teaching methods and prefer to use them as a tool to help them understand the subject better.

Table 2. Difference between the student rating score and the rating score of 3 in each of the teaching method.

No.	Test value = 3					
	Teaching method	t (Observed value)	DF	p-value (Two-tailed)	Mean Difference	Null Hypothesis Rejected/Accepted
1	Animation	14.291	62	< 0.0001	1.333	Rejected
2	Role play/kinesthetic	5.624	62	< 0.0001	0.585	Rejected
3	Group discussion	3.361	62	0.001	0.385	Rejected

It is found that Ho is rejected for all teaching methods. This means that H_1 is accepted, that there is a statistical significant difference in the student rating score from the rating score of 3 in each of the teaching method.

Third, we would like to evaluate which teaching method is best suited for students' learning. To reach this objective, we test how popular is one teaching method compared to the other.

H_o: There is no statistical significant difference in the student rating score between animation and group discussion method.

H_1 (two-tailed hypothesis): There is statistical significant difference in the student rating score between animation and group discussion method.

H_o: There is no statistical significant difference in the student rating score between animation and activity method.

H_1: There is statistical significant difference in the student rating score between animation and activity method.

H_o: There is no statistical significant difference in the student rating score between group discussion and activity method.

H_1: There is statistical significant difference in the student rating score between group discussion and activity method.

To test this hypothesis, t-test for two independent samples/two-tailed test was carried out. Results were tabulated in Table 3.

Table 3. Difference in population mean rating score between different teaching methods using t-test for two independent samples/two-tailed test (α=0.05)

Teaching method	t (Observed value)	DF	p-value (Two-tailed)	Mean Difference	Null Hypothesis Rejected/Accepted
Animation and Role play/kinesthetic	-5.352	124	< 0.0001	-0.748*	Rejected
Animation and Group discussion	6.421	124	< 0.0001	0.948*	Rejected
Role play/kinesthetic and Group discussion	1.295	124	0.198	0.200	Accepted

* Denotes the mean difference is significant at the 0.05 level.

It is found that Ho is rejected for animation and role play/kinesthetic; animation and group discussion. Ho is accepted for role play/kinesthetic and group discussion. There is significant statistical difference in the student rating score between animation and role play/kinesthetic as well as animation and group discussion. There is no statistical significant difference in the student rating score between role play/kinesthetic and group discussion.

In addition to rating score of teaching methods, students were also asked to write their comments on how teaching can be done in class to help them learn better (Appendix). Generally, students think that delivery of content in class should be active and involve visual,

audio, touch and brain stimulation. This would help them retain facts more easily and make learning more fun. By collecting such comments from students, we are able to understand student's learning styles and thereby design our teaching methodology accordingly so that the learning outcomes can be achieved more effectively.

DISCUSSION

Animations preferred over group discussion and role play/kinesthetic

Majority of the students in this study claimed that they prefer watching animation to improve their understanding about recombinant DNA technology, RNA transcription and translation process. From our feedback collected, we found that when learning a new Biology concept, traditional lecture with the help of animations would be the best approach. The mechanism of RNA translation includes sequences of events, names of the process involved, and terms for each protein involved. This is a very difficult feat for the memory to achieve if it is not taught in a logical and structured manner, which can be achieved through playing animations during lecture. By using animations, students would be able to visualize the dynamics of the complex process in addition to the explanations done by educator using PowerPoint slides. With a few play-backs following at least two post-animation questions, students are able to recall and later retain the information better. This is also reflected from students' remarks for this study. The auditory and visual learning approaches have helped enhance students' learning.

When students have a clearer understanding with the concept taught, in-class activities such as group discussion and kinesthetic method become more meaningful. Due to the dynamics of a large class, to run an effective group discussion and role play/kinesthetic methods require more preparation and planning. Logistics would be the main concern as educators may lose control when role play is carried out. Much preparation is needed for group discussion where it serves to help enhance students' higher order thinking skill unlike

animations and role play/kinesthetic method which aim towards a lower order thinking skill (Anderson et al., 2001). Our findings support a study where it was shown that there is positive learning outcome attained for role play when it is carried out in tandem with lecture where learning basics is concern (Elliott, 2010).

TYPES OF LEARNERS

Understanding students' learning style is fundamental in effective teaching. A vast body of research was done and models developed to study students' learning style. For example, Myers-Briggs Type Indicator (MBTI), Kolb's Learning Style Inventory (LSI), and Dunn and Dunn's model (Coffield, Moseley, Hall, & Ecclestone, 2004). One of the most common, straight-forward and simple assessment tool would be the VARK method. This VARK method is based on the Dunn and Dunn's model (Dunn, 1990).

Although it is quite impossible to use one instructional method to fit each individual learning style in a large classroom, understanding students' learning preference and thereafter accommodate a suitable teaching approach is important to enhance student-centered learning. As educators, we can poll students and ask their opinion about their learning preference. It is one of the simplest ways before deciding which teaching methods best suit the class needs.

In an effort to investigate the teaching and learning experiences at tertiary education, some local studies were conducted both in a public and private education setting. For example, a study amongst second year students at Faculty of Education majoring in Living Skills, University Technology Malaysia revealed that the preferred student learning style was kinesthetic style (Ibrahim & Ramli, 2010). Their findings were not similar to ours mainly due to the nature of the content being taught. Learners studying living skills would prefer a more "hands-on" type of learning style compared to visual style in our case. In another study on medical students at AIMST University, it was reported that the preferred individual learning style

was reading/writing followed by kinesthetic learning style (Kumar, Voralu, Pani, & Sethuraman, 2009). This can be explained by medical student whose personality is more intellectually-inclined. A large part of the medical syllabus also involves heavy laboratory and surgery work, thus a kinesthetic approach is also popular in medical class.

WAYS TO OVERCOME EFFECTS OF LARGE CLASS SIZE

Besides learning style, the effect of class size also impacts student learning. In order to increase student interaction, one of the many ways that an educator can do is to break the class into smaller groups and discuss a question or problem. Based on a study about implementing small group activities in large lecture class, students' perception included "This activity helped me learn more than I would have by myself", "The activity kept me interested in the course content", "I like working in groups during a large lecture class", "It was a good 'intermission' and allowed us to stand up, walk around a bit so that we could better focus on the continuation of the lecture" among the many feedback given (Yazedjian & Kolkhorst, 2007). This is one of the active learning strategies that is often used in tertiary education. From the feedback stated above, we can hypothesize that it brings benefit to students' learning not only from intellectual aspect but also emotional and social aspects which is also supported by (Petty & Brewer, 2011).

Although there are obstacles in teaching large class, not all brings unfavourable impact on teaching and learning experience. A study was conducted to investigate the difficulties of teaching large class in various private universities in the Klang Valley (Thomas, Subramaniam, Abraham, Too, & Beh, 2011). It was reported that positive teaching experience was acquired in Information Technology and Medicine faculties in that tutors often have a sense of achievement by handling large group setting. The authors feedback that by teaching large class, they would be more aware of different student learning styles and thus welcome the challenge to come out with new ideas on how to improve teaching methods. The same study also gathered tutor's feedback on how to enhance students' learning experience. Majority of the tutors recommended

to use interactive learning method. The effectiveness of innovative teaching methods in introductory biology courses in a large class was also reported in a study (Colbert, Olson, & Clough, 2007). In this study, about 60% of the students reported that the Web-based forum did help them in their learning.

LIMITATIONS OF IMPLEMENTING INTERACTIVE TEACHING METHODS AS LONG-TERM METHOD

Interactive teaching does bring positive impact on students' understanding of new concept as reflected from this study. From past experience these interactive teachings, not limited to the ones used here, were not implemented further due to several reasons. Limitation of lecture time and different preference of teaching style amongst lecturers are the main reasons. Most of the lecture time was spent in introducing new concepts using the traditional way that is PowerPoint slides. Animations were used in addition to these PowerPoint slides. When all the new concepts have been introduced, there was lack of time to run activity-based learning, from which we hope to further enhance students' understanding. This is often dependent on the learning pace of students which differ from batch to batch.

However, one study in the US has shown that lack of time should not be a barrier in carrying out active-learning in class as some topics can be done independently by students without compromising on their understanding (Walker, Cotner, Baepler, & Decker, 2008).

LIMITATIONS OF STUDY AND RECOMMENDATIONS TO IMPROVE

One of the limitations of this study is that the results may not be a good representative of the entire class because only 63 out of 96 students responded while the rest was absent when the feedback was collected during lecture class. Besides, the design (students' perception) of this study has limited the inference of data. The type of data collected that is rating score was subjective and could often be influenced by confounding factors such as personal preference of

the subject, and timing when feedback is given often affected by emotions at that time, therefore the efficacy of teaching methods cannot be inferred. Students' perception may not give an accurate measurement in the determination of the efficacy of teaching methods due to potential bias in providing opinions. There should be an objective measurement, for example assessment of academic scores before and after implementation of teaching methods to overcome this shortcoming. The duration of study can be extended for several semesters to give a more concrete data.

CONTRIBUTION TO KNOWLEDGE

Student's feedback on teaching methods at post-secondary level is not common in Malaysian context. This study serves to build a framework towards science education research in a local perspective. By asking students to comment on the teaching methods, they are showing reflective skills which is imperative in teaching and learning in higher education (Rogers, 2001). This study also contributes towards part of a larger knowledge about how to conduct active learning in a large-class setting without radical transformation of the current standard practice in college biology lesson (Allen & Tanner, 2005).

CONCLUSION

The teaching methods covered in this study are part of the many methods that aim to engage students in their learning and may not accommodate the range of students' learning styles. Nevertheless, using broad teaching methods do account for the diverse learning styles of students found in institutions of higher education, in comparison with using only one teaching method. We conclude that the preferred learning method for students who are first exposed to a Biology concept would be playing animations, which is the visual and auditory learning style. Group discussion and role play/kinesthetic methods serve as reinforcement approaches to help students retain the newly learned knowledge. Findings from our study would provide some

insight for educators teaching new Biology concept at post-secondary level in a local context and further studies on effective teaching may be conducted to build knowledge on the current science education research in the region. Creating a learning environment where students actively participate and take more responsibility towards their own learning will continue to remain as our goals to achieve at higher education.

Appendix. General comments made by students

No.	Comments / Remarks
1.	Put more video examples. These activities are helpful. Keep up.
2.	My very best I have learned and tried to understand but I think that videos and animations are more entertaining than learning.
3.	Through the animation videos. Because then I know how it really happens (the process). I also find recalling what we've learnt the previous week effective. Interaction.
4.	Experience the learning hands on through activity and lecture.
5.	I've learned to remember the steps and codings better.
6.	Better than before, because lecturer recall the previous lecture before every start of class.
7.	Make me more understand the process, have a clear image what is happening.
8.	Better learning/understanding after watching animation/video.
9.	I can know better the topic. I can remember more easily.
10.	Must understand and do revision about what I have learned by myself first. If don't understand, only ask question. Revision before every class is good.
11.	I can remember more easily if compare to previous.

12.	Animation videos, it enables me to picture out replication, transcription and translation process.
13.	I learn best when an animation/video is played repeatedly. This increases my understanding.
14.	I prefer video-based learning.
15.	Because of all UTAR's bio lecturer and tutor have a good teaching skill so that I can learn bio well.
16.	Effective enough to learn and remember the important facts.
17.	It is best to show more on animation because it greatly enhance the understanding of the topic. Besides that, I believe that having some examples of mind-mapping helps out.
18.	I learn best by myself when I do self-study. But in lecture, I find it productive when you play some animation. I dislike games and activities though.
19.	Learn by repeating key concepts.
20.	Not bad. Mind map given by lecturer is good. It is the best. Video can also give us a clearer picture.
21.	The flow of lecture is easier for me to understand. But if it could follow the flow of the lecture slide properly will be better and for us to do revision easier. The description is detail.
22.	Through animaion/video.
23.	Fun
24.	Enjoy, have fun, can remember the details well.
25.	75%. Is good to have an overview of all the topics before starting the new topic. Can learn and know better when doing activity. However, when explaning the slides using lecture notes, cannot get the main idea from each slide, and become

	blur because the slides explain is not in order. Please provide more animation.
26.	70%-should play more videos. Should summarize after each topic, giving an overall overview for the topic before teaching is good. Do revision for the previous topic every week is good.
27.	Is better to show students more interesting animation video. Because sometimes through watching video, I can understand better and able to remember the key points easily. But keep up the good work.
28.	I prefer watching video after explanation of lecturer, video I like is using simple but clear biology terms. The actvitity is good for good memorize. Group discussion is also good for me to know where is my weakness. However, I prefer lecturer to explain from slide to slide before giving summary. I am still blur for the whole chapter. But today's lecture is ok.
29.	Game summary is good. Include more videos. I find it easier to remember and visualize the whole sequence of activities for translation and transcription.
30.	The animation/video clip giving better understanding to me because it give information non-verbally. Discussion cannot give me the information as detail and correct as the animation video.
31.	Good in summing up previous lesson to ensure we remember and understand clearly.
32.	Sometimes, cannot understand by just looking at the diagram.
33.	I cannot understand fully.
34.	No comments.
35.	I learned a lot and understand well after the transcription and translation activities. But I think that the cloning activity is a bit helpless. Anyway, thank you Ms. Neik for your effort of making the subject interesting.

36.	Through activity. Play more learn more.
37.	I prefer through going through the lecture note systematically while explain, that make me absorb better.
38.	I can learn something from these activities. I can be more understand of the chapter scope.
39.	Overall ok. Sometimes teaching too fast.
40.	Still okay.
41.	Playing more animation and video can impress deeply in mind. Hopefully the final exam can be easier. Extending the break duration (5-10mins)
42.	Should do more cracking activity. It's fun and I won't feel sleepy in class. Should have 10mins break time after 1hr lecture class.
43.	Transcription = 90%; Translation = 90%; Mutation = 85% Playing video animation is better for us to learn, 'cracking the code' activity is a waste of time. Longer break time please.
44.	I like to have some activities during lecture class, so that we don't get bored easily by the lecture notes. From the group discussion, I can remember more. Learnt much about transcription and translation. Wish to have 10mins break time instead of 5mins.
45.	After teacher's explanation, playing the video helps.
46.	Through explanation and examples given by lecturers.
47.	Brainstorming and Q&A.
48.	Q&A and open discussion.
49.	I really like all these activities in class. It makes me understand better. Great effort, really.
50.	Can understand and apply it.

51.	I understand how biotechnology works. I learn how to cut and paste the DNA by taking part in the cloning activity. It was fun while learning.
52.	Very good. Not boring. Learn something.
53.	It's useful in understanding cloning activity.
54.	It's fun learning in activity way. It helps in memorizing facts.
55.	The flow of lecture is easy to understand. Explanation of lecturer also very clear.
56.	Allow me to understand more about the process of cracking the code that involve transcription and translation. It can be said this activity is good for understand the process. Animation demonstrate the process to allow us more understand what happened and how is the process of things we learn. Know how to clone the things in biotechnology, this will help me in my degree. Through all activity conducted, it allows me more understand how and what is the process that the things I learned. Addition more revision and referring, I think it can help me to achieve a good grade in biology.
57.	I learned many things throughout the activities in class. The activities make the lesson more interested and easier to understand.
58.	It is quite fun when learning, overview before enter the chapter is good for us to know what we got to learn. But sometimes I cannot catch up because it is a bit too fast when teaching, and a bit confusing when does not follow the slide in notes. In short, it is interesting.
59.	It is quite fun. It helps much but sometimes confuse. It is excited and scaring like a test as everyone doesn't like to giving wrong answer. It is so so so fun. Just know that I learn a little but need to revise with reference book as I sometimes actually don't know what the lecturer is talking.

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