Enhancing Biology Learning Experience Through Physical Activities and Online Teaching Tools

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Abstract
In recent years, various initiatives have been taken by countries all over the world to increase students' interests in the learning of science subjects in order to meet demands of increasingly challenging curriculum in tertiary education. At the pre-university level (pre-U) in Malaysia, Biology is a compulsory subject for students who wish to pursue life sciences related fields such as medicine, dentistry, and health sciences. Transitioning, adapting, and familiarizing oneself with the learning processes at pre-U is a big shift for students, which puts great demands on lecturers to employ various activities in the classroom. One of the ways to enhance the teaching and learning process of Biology is through physical activities and online teaching tools, which have been employed in Biology lectures and tutorials in the ASASIpintar, Universiti Kebangsaan Malaysia Program (Aspi). Each method of employing physical activities and online teaching tools varies according to class size and time. This practice can be applicable as initiatives (1) to create learning Biology at pre-U fun and entertaining, (2) to enhance students' interest in learning Biology at pre-U and (3) to encourage innovation among lecturers in the teaching and learning Biology at pre-U which is in line with STEM for 21st century learning.

Keywords: Biology, Pre-university, Physical activities, online teaching tools

Introduction
At the pre-university level, transitioning, adapting, and familiarizing oneself with the learning process at pre-U is a big shift for students, which puts great demands on lecturers to employ various activities in the classroom. McLester (2005) in their research on challenges using games in teaching, found that nearly seventy percent of students learn best actively and visually. In ASASIpintar program, a one-year foundation centre for pre-university student at Pusat GENIUS@pintar Negara Universiti Kebangsaan Malaysia, the author employed a student-centered learning style as an active learning activity in the classroom. This idea is to include physical activities in the classroom coupled with the online teaching tools to enhance learning experience in Biology class. The idea was to enhance the learning experience in terms of interest and motivation of the students in a fun and active ways. This method was first was employed into the classroom starting from the 2016/17-student cohort. Each cohort consists of 150 to 250 students per batch. Students were divided into 7 to 10 set comprises 20 to 25 students in a set. These physical activities were used in Biology lectures and tutorials only. Usually, the physical

activities were in the game format. It was conducted by the lecturers, based on the topics learned and it was done within the allocated time and space with safety measures at all time. The online teaching tools were actively utilized coupled with the physical activities from time to time. For this case study, selected physical activities and online teaching tools were chosen for the interview session.

ASASIpintar is a pre-university program under Pusat GENIUS@Pintar, Universiti Kebangsaan Malaysia where there are students between 17-19 years of age enrolled in this program. At pre-university level, transitioning, adapting, and familiarizing oneself with university style of learning process is a big shift for students, which lays great demands on lecturers to employ various activities in the classroom. Thus, Biology lecturers at this center has been exploring and exercising different activities and teaching methods in the classroom to inculcate student-centered learning, boost students' motivation and enhance their interest. Therefore, this paper explores how physical activities and online teaching tools employed in the classroom could enhance Biology learning experience for ASASIpintar students.

There are two objectives for this case study. Each objective is closely linked to enhance Biology learning experience. The objectives are:

i. To determine how physical activities, enhance Biology learning experience for ASASIpintar students.
ii. To explore how online teaching tools, enhance Biology learning experience for ASASIpintar students.

Physical activities in classrooms

Physical activities are usually used in outdoor and sports related subjects. However, in this study, the author incorporated physical activities usually in game form, which are played in the classroom. Psychologists have long acknowledged and understood the importance of play in cognitive development and learning. Piaget (1962) for example, described play as being integral to, and evolving with, children's stages of cognitive development. There are very few studies dealing with higher learning education students that using physical activities in classroom. Almost all studies were in relations with secondary and primary school children. Furthermore, there is little study involving science subject, especially Biology. Prihhartini (2018) conducted a study to investigate the importance of physical games as part learning grammar. In fact, many authors in language subject such as English language teachers have tried to use physical activities especially in game form in the classroom, found that games in the classroom were important. Tuan & Doan (2010); and Prihhartini (2018), reported that especially for physical games, it will force them to activate their mental capacities and stimulate neutral networks, since the games will likely ask the students to get out of their seats and instigating the learners in learning and retention. There are various formats in gaming activities in the classroom. Different formats of gaming activities tend to show learning benefits because of the active learning components that are present in each activity (MacKenty, 2006; Schrand, 2008). MacKenty (2006) also states that, the act of problem

solving that makes games so engaging, devoid of challenge or risk of failure, games really aren't all that much fun. Incorporating physical games has enforced active learning to the students. It is an effort to make learning authentic and refers to techniques where students do more than simply listening to a lecture. Through this way of study, students are involved in discovering, processing, and applying new information (Van De Bogart, 2009). Previous researchers agreed that students "need to be engaged more and to be placed at the center of the learning experience to change from 'passive vessel' to 'active participant'" (Pannesse & Carlesi, 2007). It is clear to us that by implementing physical activities in a game format for example, are beneficial to the students.

Online teaching tools in classrooms

In the era of 4IR and information technology, it is essential to embrace the importance of utilization of online services such as online teaching tools in the classrooms. The current scenario of extensive use of computers and the internet has created opportunities to improve education by applying different e-learning techniques in courses being taught [Bhattacharya & Nath (2016); Verdu *et al*., (2017)]. Nowadays, almost everyone is using smartphones and laptops for their daily life activities, and this has become necessity. People are depending on their gadgets for everything, especially with social media applications; they cannot leave their gadgets every time they were outside. Students are hooked on the internet and online activities. So, it is important to take advantage of this situation and utilize the online teaching tools for the students. The teachers as "digital immigrants" must shift gears to keep up with the fast pace of the new generation of students (Prensky, 2001). In addition to conventional medium of teaching, online teaching tools can be a great medium to the education purpose. Dzvapatsva *et al.,* (2014) mentioned that unlike the traditional face-to-face medium of teaching which have some space and time restrictions, in electronic media, the world has made the classroom, which is available 24/7, and not confined to weekdays. Online teaching tools like Kahoot and Quizizz can enhance student's cooperation and motivation among themselves through competitiveness while having fun. Competitive learning is another effective method to increase students' motivation and satisfaction as well as to improve their learning achievements (Hwang *et al.*, 2012; Verdu *et al.,* 2012).

Physical activities and online teaching tools employed in ASASIpintar program

There are three main physical activities employ during Biology learning in ASASIpintar Program. "Uh,No! I Don't Know!", "Splash Quiz" and "Animals Sounds?". For "Uh,No! I Don't Know!", a deck of card with three colours; green, yellow and red is distributed randomly to all students. If student receives a green card, he has to answer question based on the topic of the day, while a yellow card allows him to ask members of the class about the topic. A red card is a wild card where students are given the options to be innovative with the given topic. This activity encourages active participation, as students need to be ready to answer, ask or think on the contribution to classroom activity. "Splash Quiz" is an activity where students are divided into three roles, which are: "the interrogator", "the participant" and "the executioner". "The interrogator" will ask question regarding topic of the day to "the participant" who will be seated on a special chair wearing a raincoat. If the submitted answer is correct, he will be awarded with marks while wrong answers lead to punishment by "the executioner". The executioner will splash water gun

towards “the participant”. This activity continues by rotation by all students. In the “Animals Sounds?” activity, students are divided into small groups where they are assigned with different animal sounds. The head of the group is blindfolded, and the group members whisper the sound and later he needs to find his group through the sound. Each group member is given a piece of puzzle with parts of the topic they learn on that day. Once the head of the group finds the group member, he can complete the puzzle and answer the questions. These physical activities are employed to cater all types of learners whether they are visual, auditory, or kinesthetic.

Some of the online teaching tools which are commonly used at this center are “Kahoot!”, “Telegram”, “Quizizz” and “Nearpod”. These online teaching tools are used to broaden students’ learning space where they are not confined only in the classroom. This also allows creativity in learning, promotes digital literacy and creates online teaching and learning collaboration.

Methodology

The study used qualitative approach to develop the instrument, data collection procedure, and data analysis method. The detailed qualitative accounts often produced in case studies not only help to explore or describe the data in real-life environment but also help to explain the complexities of real-life situations which may not be captured through experimental or survey research (McDonough & McDonough, 1997). Thus, to attain a better understanding of the phenomenon, the researchers employed case study design as it allows researchers to develop an in-depth analysis of how Biology learning experience is enhanced through physical activities and online teaching tools. A total of seventeen (17) participants were involved in this study. All of them were randomly selected from three different cohorts (2016/2017, 2017/2018 and 2018/2019). These students are currently in Universiti Kebangsaan Malaysia continuing their first degree. The students were contacted through various ways such as by telephone or other online applications. The study used semi-structured interview method to collect data from the participants. This is in line with Creswell (2014), who agreed that interview in a qualitative approach helps researchers understand how individuals have personally experienced a situation and it gives more meaning in theorizing people within the contexts in which they live in (Willig, 2001). In this study, the questions for the interview were designed open ended and semi-structured. All 17 participants were gathered for interview on the 15th April 2019 and the interview took around 6 hours to gather the necessary data from all participants. The interview was recorded using a laptop that has audio recorder software.

Results and Discussion

Physical Activities

Based on the interview transcript regarding the three physical activity employed in the class (1) *Uh! No, I don’t Know*, (2) *Splash Quiz* and (3) *Animals sounds*, the evidence extracted from the interview are divided into three sections for the first research objective.

How do you find the physical activity employed in the Biology class?
All 17 participants described the activities were fun, interesting, and engaging. Some even said that the activities were beneficial. It helps them to use their body and mind together during the activities.

> *"The physical games (activities) are very **engaging**, **fun** and **beneficial**. A very efficient way to get everyone going, and **good exercise for both the body and mind**"* *(Aaron)*

By doing the physical activities in the form of games, it helps them to remember and understand the topic better.

> *"I never expect that such way of learning through physical games **helped me a lot** in biology classes. Sometimes, I have problem in **remembering facts** and biology terms, but I can clearly remember through the games we have played in class"* *(Afiqah)*

Other student also supported this.

> *"I think it is a great and creative way to learn in fun. Students can **remember a lot of terms in biology** when they are learning and enjoying at the same time"* *(Alfiah)*

This suggests that the physical activities employed in the class is engaging, fun, beneficial, and help the students to remember biology terms.

Do you think the physical games enhances your interest in Biology?
Almost all participants (90%) agree that the activities enhance their interest in Biology. The remaining participant informed that they already have high interest in Biology, so the activities help to elevate their affinity towards Biology learning. Activities such as games help them to visualize Biology concept.

> *"Yes, it does. Because in physical games, **it helps students to visualize** (actions of each component) **all the biological processes** and built my interest towards biology. Compared to reading and memorizing all the facts, **physical games has helped me to understand more**"* *(Irfan)*

It also increases the student's motivations and attention,

> *"Yes. The games tend to **increase my overall motivation in learning**. Physical games spark my competitiveness leading to **more participation and attention** during Biology sessions"* *(Fatini)*

The participants further agree that apart from increasing their interest, physical activities also help them to memorize the facts by doing,

> *"Yes. I do think the physical games employed have enhanced my interest in Biology because* ***I tend to memorize and understand what I have done*** *rather than what I have read"* *(Syuhadah)*

The same feedback was also mentioned by another participant,

> *"Yes. I have never had an interesting study like this in a class before except just for a few days during my secondary school.* ***It helps me to picture the information directly rather than just imagine it*** *and* ***remember some important topic during the activities****''* *(Aisyah)*

Overall, the physical activities have helped the students to visualize the ideas, increase and motivate them to learn biology more.

In your opinion, should lecturers employ physical activities in classroom?
All the participants agree that lecturers should employ this kind of activities in the classroom. They really think that physical activities are fun, and the topic becomes more engaging, interactive and easier to understand.

> *"In my opinion, if a lecturer has an idea* ***to build more engaging and interactive techniques****, they should do it, because* ***those techniques enable us to remember and understand things better;*** *such as a role-play about immune system topic that I involved in before. It allows me to understand about the system better"* *(Syakir)*

This is in line with another student,

> *"In my humble opinion, lecturers* ***should employ fun and engaging physical activities in classroom*** *because most students find that,* ***reading notes and lecture slides are extremely boring"*** *(Maliana)*

The participants also agree that lecturer should employ these physical activities to prevent boredom in teaching and learning and it also could release stress.

> *"Yes, I think so. Sure, I find it is comfortable learning using old school method BUT by* ***employing fun physical activities, both the students and lecturer will have amazing time learning****. Because at the end of the day, learning is a two-way process, and these activities served as platforms to achieve it. At the very least, students will engage in the subject* ***instead of sleeping through the class****"* *(Nur Izzah)*

> *"Yes**. Engagement and involvement is the main key in learning**. The more involvement in learning, the better I learn"* *(Avinash)*

> *"So, for me, I tend to get sleepy and bored easily. **Physical activities will help me to stay awake during classes and focus more during lectures**. Thus, a better understanding"* *(Syuhadah)*

> *"Yes, at least a few physical activities to **loosen up all the stress** in the classroom"* *(Alyssa)*

Online Teaching Tools

There were four online teaching tools employed in the class namely (1) *Kahoot*, (2) *Quizizz* (3) *Telegram*, and (4) *Nearpod*. From the interview's transcript, the evidence extracted were divided into three sections in attempt to answer the second research objective.

How do you find the online teaching tools employed in the Biology class?

The participants found that the online teaching tools used were helpful and useful in studying Biology.

> "*Online teaching tools employed in the Biology class here have amazed me in some ways. The tools have opened my mind that learning is not just limited to reading printed notes and books. I personally prefer online learning because **the notes are usually simple and easy to understand"*** *(Maliana)*

It also helps the students to explore more because it has variety and abundant information online.

> "*For me, the online teaching tools that have been applied in the class such as **kahoot or quizzes help me to explore more** about the type of questions that will be asked in exam. Furthermore this methods allows me to gather **new information** about the topic learned"* *(Aisyah)*

> "*The online teaching tools used in the class are **useful in aiding to the learning process**. For example, Kahoot is very convenient in testing out student's knowledge and articulation"* *(Fatini)*

Do you think the online teaching tools employed enhances your interest in Biology?

The responses received from the participants suggested that the online teaching tools employed are able to enhance their interest in Biology.

> *"Yes. Reading books with a lot of text usually boring. So I prefer colorful **animation and visualization** for my studies because it feels like a lot more fun"* *(Afiqah)*

Similar response was also received by other participants,

> *"Yes. For me, biology is already intriguing as it is but having **a variety of medium to learn** it is really eye opening. It really gives you a change of pace especially when you are accustomed in receiving lectures" (Izzah)*

> *"I think the online tools especially the videos helped me **to see the clearer picture of things** inside our body. In biology, there are certain topics that are hard to understand because it is difficult for us to imagine by ourselves. The online tools, **increase my interest because I can imagine it better**"*
>
> *(Syakir)*

In your opinion, should lecturers employ online teaching tools activities in class?
The participants also expressed their agreement that lecturers should employ online teaching tools activities in class. The participants suggest that online teaching tools are an effective medium to connect with one another, provide a more interesting and engaging learning experience which allows them to be creative, as well as improve their understanding of the subject.

> *"In my opinion, lecturers should really employ fun and engaging online teaching tools activities in class as it not only help students **to connect with lecturers online**, but it is also a platform for **students to give feedbacks and improve their understanding in Biology"*** (Maliana)

Other participants are also in agreement with the above statement.

> *"Yes, more fun teaching tools should be employed as I find it is **more interesting and less stressful**" (Alyssa)*

> *"Yes. Because we need to **make full use of the internet**. I think in future, students will be more interested in online teaching compared to lecture classes" (Irfan)*

> ***"**Yes. Because we need **to utilize the web for great purposes** and what is better way to exploit the web than **using it to gain knowledge**" (Izzah)*

> ***"**In my opinion, online teaching tools need to be implemented in every class because learning methods that **use visual and listening skills** can sharpen students' thinking and imagination" (Nurin)*

Generally, it can be concluded that implementation of online teaching tools usage in the classroom can be very beneficial in enhancing Biology learning experience. There are various ways, which could be employed by educators to make learning more interesting and more meaningful to learners. In this study, it is indeed an evident that physical activities and online teaching tools can enhance Biology learning experience with three beneficial findings; it makes learning environment fun and engaging, enhances understanding of a concept or topic, and boost motivation and interest. The findings portrayed that students learn best when the learning environment is fun and engaging. This is in line with Lu *et. al.*, (2007) as cited in Wright (2011) that the use of internet leads to student-centered learning which shows significant positive learning culture. This also portrayed the needs and importance of fun and engaging learning environment as students spend almost eight to nine hours daily on campus with only one-hour break. Learning Biology can be tricky with a lot of concepts and theories for students to understand and memorize. One of the findings in this study suggests that physical activities and online teaching tools can really assist them in understanding the topics and concepts. Additionally, the finding of this study is also parallel with what is suggested by Plass *et. al.*, (2015) that game-based learning is able to engage and motivate players provided a few important elements are taken into account such as the design, mechanics, narrative and the goal. Thus, it is important for educators or lecturers to appropriately design the games and physical activities to be employed in class to gain positive impact on students' motivation and interest.

Conclusion

In conclusion, the findings in this study will be able to assist educators in planning an interesting and engaging teaching tools for their students. As a recommendation, there is also a need on attending courses or seminars, so that educators will obtain more ideas on how to execute a classroom using physical activities and online teaching tools. In addition, administrator must also encourage educators to employ various teaching strategies by providing more research grants to conduct action research for better understanding the effectiveness of what to be employed in the classroom.

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