INNOVATIVE PRACTICES IN HIGHER EDUCATION EXPO 2015 (I-PHEX)

Registration Form

1. LEAD INNOVATOR PARTICULARS

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3. INNOVATION PARTICULARS

Category *

(i) ***Innovative Student-Centred Learning Approaches***

Title:

Blended Student Learning Experience: Combining Virtual Learning Environment, 3D Design and Active Community Engagement within a Framework of Knowledge Transfer Program

Rama Yusvana[1], Roslinazairimah Binti Zakaria, Farahanim Binti Misni

Extended Abstract *

(Extended abstract must be a minimum of 1000 words)

In this era of digital information, teaching tools and learning resources have now become more widely available and accessible to both students and academics to use. This opens a possibility to create a blended and more engaging / stimulating learning experience for students to increase their understanding of a particular topics or concept given during the class. Some of the tools to achieve this objective are the use of free and easy to use '3D design' to improve students spatial abilities - particularly for engineering and science students, as well as internet-based *Virtual Learning Environment* (*VLE*) that students can use at their own pace. In addition, hands-on experience and an opportunity to verbally communicate the knowledge learned in the class to other people, such as the local community, would enhance student understanding and learning experience.

Many of the problems that academics face during the teaching and learning exercise include lack of motivation by the students which could be derived from the lack of understanding for a particular topic or concept being taught in the class or (to be fair with the students) could also be due to monotonous teaching practices given by the academics. In this abstract paper, the author will briefly describe the implementation of '*Blended and Active*' students-centred learning tool as one of the teaching innovations or methods which could be used to minimize the problems described earlier.

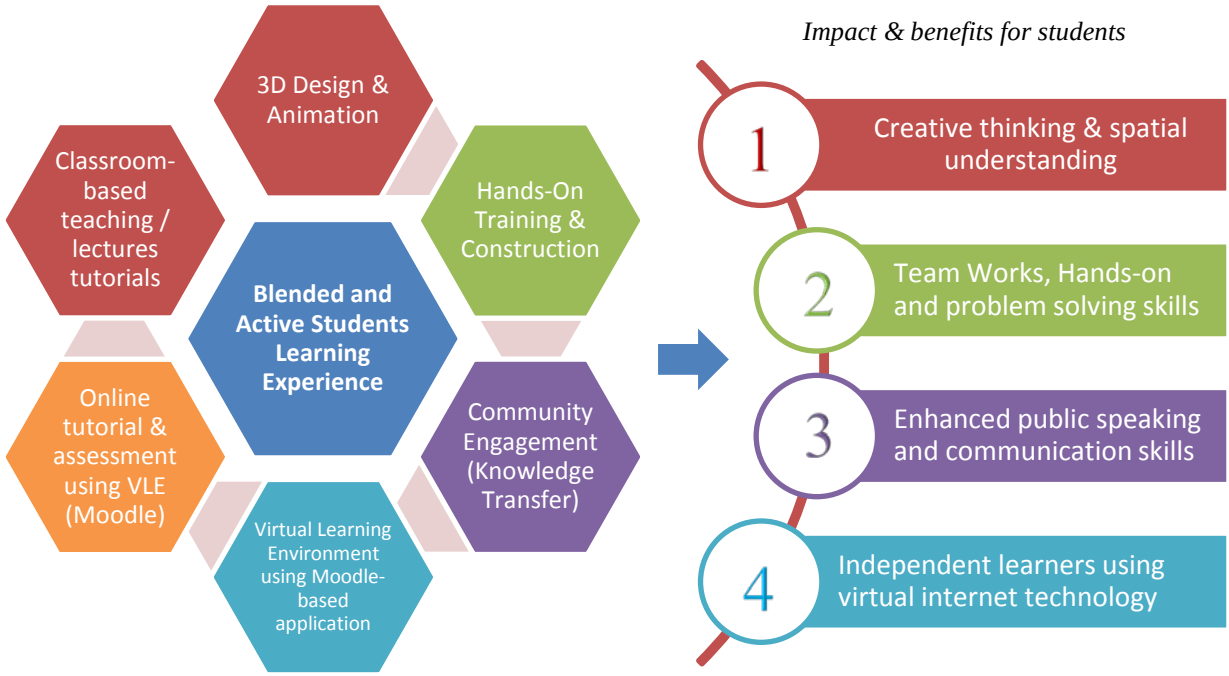

Figure 1. '*Blended and active*' student learning experience.

Blended and Active students learning experience (Figure 1) refers to the use of multimedia (such as 3D design, animation and video), interactivity using online 'open learning platform and assessment tools (VLE)' such as Moodle, as well as active hands-on participation of the students. The later can be implemented during the classroom / laboratory session or preferably in the form of 'community engagement' within the framework of *Knowledge Transfer Program* for community which has been used by the author to teach some courses or subjects in our faculty. In this abstract paper, the author will briefly describe the key features of the innovative teaching practices and show some of the results of implementation and impacts they have given to the students as well as to the local community. The main benefits for the students are briefly mentioned in Figure 1, which includes increased spatial understanding, creative and innovative thinking as well as hands-on and communication skills.

In some engineering and science courses that involve devices (such as biosensor, biomedical or biotechnological devices), students could be expected to obtain a full or better understanding of the concept and the device if the teaching facilitators (teachers, lecturers or presenters) use 3D design and animation tool to illustrate the concept and the system. In particular, this teaching tool helps increasing students spatial understanding of the object. One of the easiest, free and widely-used 3D design software is *Google Sketch Up*. It comes with full online video tutorial for the users to build any 3D objects from scratch. Alternatively, the free software comes with an online community-based library (or warehouse) of 3D objects which the users can download and use freely (for modification, adjustments, etc.) for non-commercial or educational purposes. Figure 2 shows an example of 2D snapshot of a 3D object that the author has used in the classroom for teaching. The object was designed using a *Google Sketch Up* and constructed in real-life by the students.

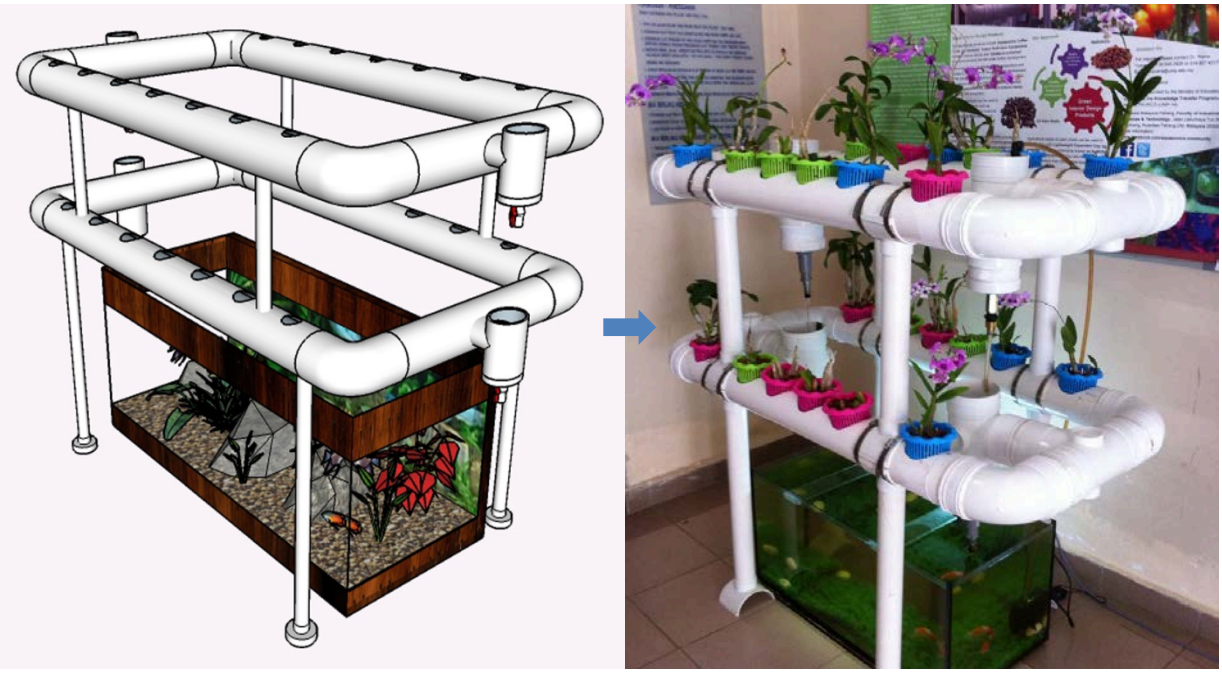

Figure 2. Example of implementation from a '3D design' of an indoor aquaponics orchid-growing kit to the construction of the actual object, *Google Sketch Up* can be used to enhance teaching and learning experience.

During the construction of the device (aquaponics system), students develop their team work and hands-on skills as well as sense of togetherness. Figure 3 shows outdoor activities of the students

developing the product that include training or briefing by the instructor, building up the system (construction) and finally assessment of their affective and psychomotor domains through direct observation and following a specified rubric assessment system. This is in addition to classroom teaching of the theoretical materials and functionalities of the device.

Figure 3. Hands-on training of UMP students for the construction of a portable aquaponics system followed by assessment of the students affective and psychomotor domains for organizing, conceptualizing and team-work as well as their hands-on (motoric) skills.

The next step following assessment of the students affective and psychomotor domains, is to assess their communication skills by engaging with the local school community. This method further increases their (cognitive) understanding of the system while practicing / showing the construction of the system to other students. Figure 4 shows students of Universiti Malaysia Pahang, Faculty of Industrial Sciences and Technology under Industrial Biotechnology program interacted with the younger (junior / high school) students explaining the concept of the technology (aquaponics) in an easy-to-understand language, under the *Knowledge Transfer Program* for community funded by the Malaysian Ministry of Education (Grant Number: FK-IRC/3 (UMP-14), Period: 2014 - 2016).

Figure 4. Engagement of the local school communities by the UMP Industrial Biotechnology students (2014 / 2015) under the *Knowledge Transfer Program* for Community. The schools shown are Al-Irsyad Islamic School Kuantan and Sains School Sultan Haji Ahmad Shah, Kuantan. The activity involves a total of 98 students from the local community.

The result of community engagement by fifty-six (56) UMP Industrial Biotechnology students (2014 / 2015) has resulted in a positive impact to both groups of students. Figure 5 shows some of the feedbacks from the school community indicating satisfactory (excellent) program has been given by the trained UMP students. From the data of 98 secondary school students (47% female and 53% male) with age ranging from 13 years old (26%) to above 16 years old (13%), it shows that 93% of the students agree to have received new skills by this outdoor and hands-on Knowledge Transfer activities conducted by students at university level (i.e. the UMP students). The data also indicates (even only qualitatively) that 82% of the 98 secondary school students

have an increased appreciation to science due to the application and peer demonstration of the system. From the video documentation that we have recorded, the school students were able to construct aquaponics system in a team environment without receiving further assistance from the UMP students. This indicates that hands-on and teamwork construction of a product or a technology have a significant impacts to the cognitive learning (understanding) of the students.

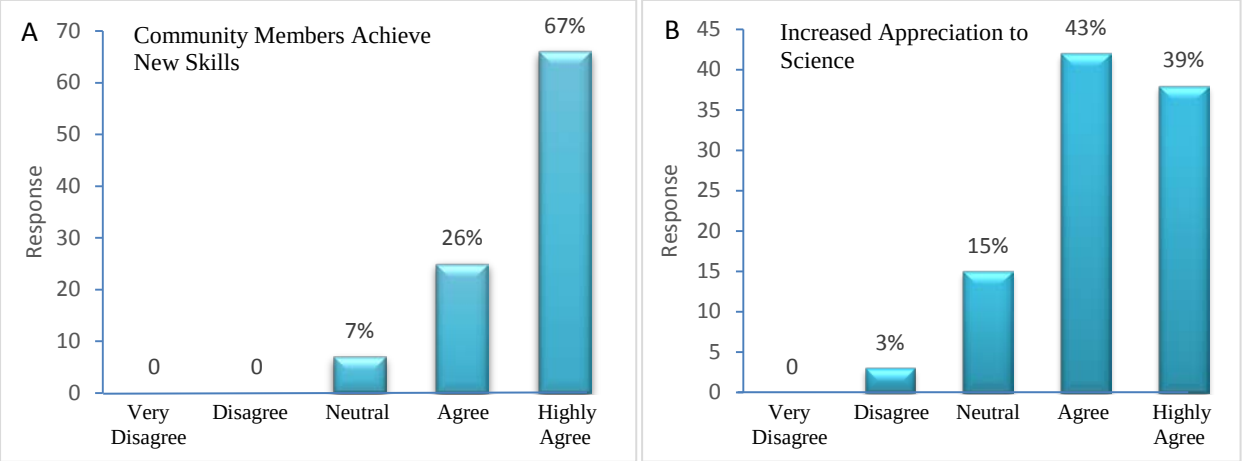

Figure 5. Qualitative response from the community in terms of (A) Knowledge Transfer by the achievement of new skills and (B) Increased appreciation to science.

The implementation of *Virtual Learning Environment* (via Moodle-based application) in UMP campus-wide for teaching, learning and assessment in addition to normal (classroom-based) teaching session has overall increased students' academic performance and satisfaction in learning. Typical sample of students performance as a result of blended *Virtual Learning Environment* implemented by the author in the last two semesters is shown in Figure 6, with only 1 (or 2) problematic student appeared in each semester due to various reasons such as failure to perform or attend the final exam, etc.

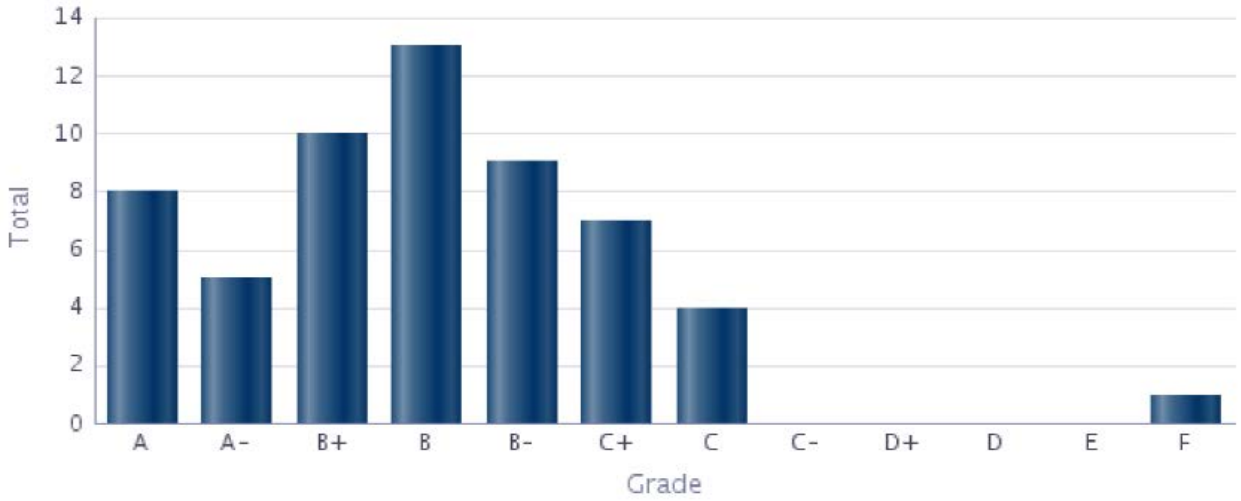

Figure 6. A typical (sample) of students' academic performance as a result of '*Blended Virtual Learning Environment*' conducted by the author in Biomanufacturing subject (2014/2015).

The use of *VLE* (*Moodle-based application*) for assessment purposes allows academics in UMP to set the mode of quiz to be closed-book or open book. The open book quiz or tutorial could be

conducted anywhere and anytime by the students within the time and duration specified by the examiner. However, the closed book assessment using internet-based (Moodle) application, must be conducted in a computer room where the examiner can invigilate the progress of the assessment (quiz or test) as shown in Figure 7. The results of these two different modes of assessment (closed-book and open-book) are expectedly quite different. Figure 8 shows that many of the students achieve well (or high grade) under open-book quiz or tutorial. This is an expected results for tutorial type teaching or assessment. On the other hand, the result of closed-book quiz or test shows a more normally-distributed achievement by the students (*Gaussian* distribution).

Figure 7. Typical set up of an online (closed-book) assessment using internet-based (virtual) learning environment (Moodle-based application)

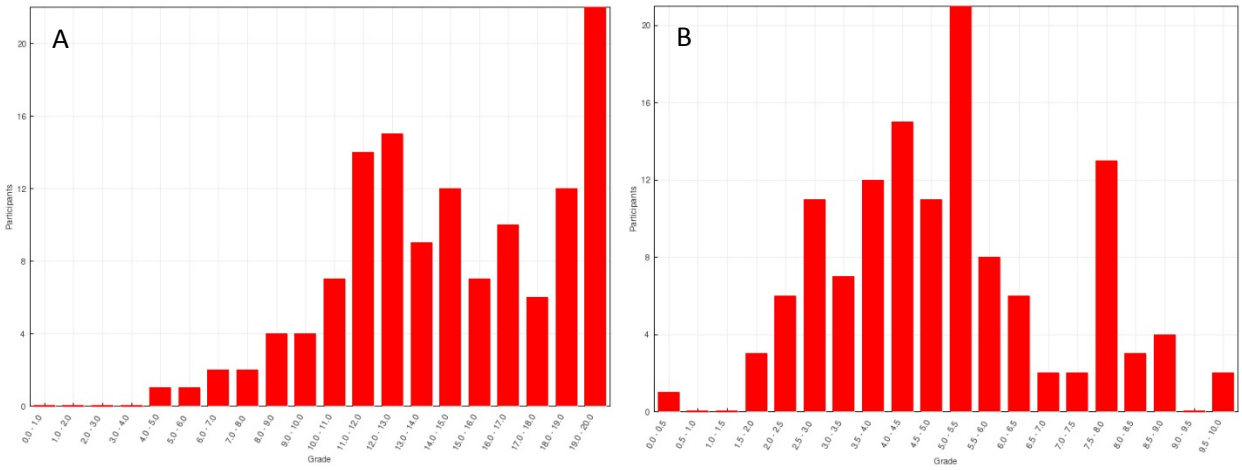

Figure 8. Typical results of assessment using internet-based *Virtual Learning Environment*. (A). Open-book quiz or tutorial. (B) Closed-book quiz or test.

Depending on the nature of the subjects, most lecturers in the Faculty of Industrial Sciences and Technology, Universiti Malaysia Pahang have implemented blended teaching and learning using *Virtual Learning Environment* (*VLE*). Table 1 shows the summary of the activity for Semester 2 Session 2014 / 2015. Due to confidentiality matters, detailed list of courses that have or have not met 'Blended Learning' mode are not shown in Table 1. According to the Table, 49 % (or 44 courses) have not achieved blended learning mode in our faculty. These are mainly Laboratory Courses which are offered in almost all core subjects, or alternatively Industrial Training courses and Final Year Projects for four (4) main academic programs in our faculty.

	Number	Percentage
Course Offered	90	100%
Course Offered achieved Blended Learning Mode	46	51%
CAP PSPTN Blended learning Mode Target	45	50%
Course Offered not achieved Blended Learning Mode	44	49%

Table 1. Summary of courses offered by the Faculty of Industrial Sciences and Technology achieving 'Blended Learning Mode' using Moodle-based application during Semester 2 Session 2014/2015.

Students Satisfaction (Evaluation) Surveys for teaching and learning activities for all academic members in the University Malaysia Pahang are also conducted regularly by the local academic administrator or authority in UMP. The result of implementing *Students-Centred Blended Learning* mode by the main author of this abstract is summarized in Table 2.

Semester	Session	Category	Average Mark (%)	Average Index
2	2014/2015	Lecture	TBA	TBA
2	2014/2015	Laboratory	TBA	TBA
1	2014/2015	Lecture	87	4.35
2	2013/2014	Lecture	91	4.53
2	2013/2014	Laboratory	86	4.31

Table 2. UMP Students feedback / evaluation survey towards the overall teaching and learning activities (including the use of *Blended Learning System*) conducted by the author[1].

From Table 2 it can be seen that the use of *Blended Learning* mode for teaching and learning activities conducted by the particular lecturer (the author) in the previous three (3) semesters received an overall mark of around 88% from the students. In our grading system, 80% and above is considered first class (A) performance.

Therefore, it can be concluded that the use of *Blended and Active Students-centred Learning* approach gave a positive effect towards both the students and the community. The role of academics (lecturers and teachers) should mainly be the facilitator of teaching and learning activities. Students of all ages can now access all the information they need in the palm of their hands via the use of smart phones, tablets and computers connected to the internet. What students really need is the guidance that connects theoretical materials taught in the class to the real world application. The use of *Virtual Learning Environment* and 3D design tool as well as engagement with the (real world) community could enhance students early learning experience at school and at higher education institution.

List of Educational References

(References used for the innovation)

Chou, Shih-Wei, and Chien-Hung Liu. "Learning effectiveness in a Web-based virtual learning environment: a learner control perspective." Journal of computer assisted learning 21.1 (2005): 65-76.

Gerhard Fischer (2011). Social Creativity: Exploiting the Power of Cultures of Participation. Seventh International Conference on Semantics, Knowledge and Grids

Norena Martín-Dorta, José Luis Saorín and Manuel Contero (2008). Development of a fast remedial course to improve the spatial abilities of engineering students. Journal of Engineering Education. Volume 97, Issue 4, pages 505–513, October 2008

Olkun, Sinan. "Making connections: Improving spatial abilities with engineering drawing activities." International Journal of Mathematics Teaching and Learning 3.1 (2003): 1-10.

Internet resources:

https://docs.moodle.org/29/en/About_Moodle
http://en.wikipedia.org/wiki/SketchUp

List of Related Publications
(Publication produced based on the innovation)

-

List of related IPs
(Please list down the related IPs)

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List of related teachings awards
(Please list any related awards based on this research)

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Track Record of Implementation *
(eg. 3 semesters / 2 years in Department of Civil Engineering UTM, etc)

Three (3) semesters in Industrial Biotechnology Program, Faculty of Industrial Sciences and Technology (FIST), Universiti Malaysia Pahang

4. POST I-PHEX 2015 WORKSHOP

"Making Academic Change Happen" Date : 7 - 8 August 2015 Venue: Higher Education Leadership Academy (AKEPT) Campus, Bandar Enstek, Negeri Sembilan Speaker : Prof. Dr. Julia Williams, Rose Hullman Institute of Technology, USA I-PHEX participants can apply to join this workshop with no extra cost. Places will be awarded to only 50 selected applicants.

To apply, please provide a 100 word statement of interest
Successful applicants will be notified by the organisers. Accommodations will be provided.

I would like to attend this workshop because I would like to know the latest and the most effective method to optimize teaching and learning experience for my students. I would like to know how internationally renown academic practitioner such as Prof. Dr. Julia Williams conduct academic practices in her institution.

- ☑ I hereby certify that all the particulars given in this form is accurate. I have obtained the consent of all the members and permission from my institutions to use this innovation for the purpose of competition and exhibition at I-PHEX 2015.

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