Survey on the Challenges Faced by the Lecturers in Using Packet Tracer Simulation in Computer Networking Course

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Abstract

Simulation refers to a visual technology aid that is rendered capable in assisting students learning the abstract content which was deemed difficult to grasp through traditional method. This is especially true for Computer Networking courses, which consist numbers of abstract contents that requires suitable methodology and materials to support students’ learning. For instance, The Diploma of Information Technology (Networking) course have adopted the Packet Tracer Simulation (PTS) as their students’ practical training material. Nonetheless, it has turned out that students’ examination results have yet far from satisfactory. This might happen due to various factors, which include the teaching and learning methodology of the course. Taking this into consideration, a survey was conducted among the lecturers to identify the problems they faced throughout the teaching and learning process, even with the help of instructional simulation. The study was conducted in an interview form to identify the difficulties faced by the lecturers in enhancing their students’ capability in applying the theories learnt via simulation to the actual real-world condition. The study focused upon the learning content that is abstract in form and also some programming elements. In conclusion of the findings, this study proposes that the laboratory work activities need to be improved by employing engagement taxonomy as its preparatory guidelines.

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1. Introduction

The electronic learning technology or e-learning is now able to strengthen the Higher Learning Institutions to become more competent and are able to prepare the graduates for the global market. Among the objectives of the national E-Learning Policy (DePAN) are to prepare students to be more active and responsible for his or her own

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learning. DePAN is translated in the form of e-learning activities such as forum, digital video and simulation (DePAN, 2011). This growth of technology is advocated by the exponential computer and information technology growth but more importantly, the capacity of the e-learning itself that can magnetize the student’s interest to learn (Sun & Cheng, 2007). One of the interesting characteristics contained in e-learning is the capability to integrate the diversity of the media such as texts, pictures, audio, animation and video in producing multimedia materials which promote the significance of reading and at the same time, prepares the students with good educational materials (Kettanurak, Ramamurthy & Haseman, 2001).

There is an unconsciously beneficial use of the simulation in e-learning activities, especially with regards to the flexibility, interactive nature and the fact that it is able to support self-learning approach (Thomas, 2001). A simulation is able to act as a catalyst to increase the potential effectiveness of the delivering of formal education learning content (Akilli, 2007), stimulate active learning (Dori & Belcher, 2005), and prepares students to apply learning, skills and knowledge that they have learned (Gredler, 2004). A simulation is even able to provide an understanding towards learning abstract content (Janitor, Jakab, & Kniewald, 2010), and using the aid of technology effectively in helping to improve the teaching and learning processes (Rieber, 2005).

Various deliveries of teaching and learning which adopt the concept of simulation, have been used actively especially in visualization learning. Visualization is used as a teaching and learning technique for understanding abstract contents (Dighe, 2003; Janitor et al., 2010), and it requires high imagination to simply be understood. It is a marriage of ideas, concepts, data or other information with images and animations presented in a graphic form (Janitor et al., 2010).

The simulation method serves as a computer-based program that contains a system, a process or a model like equipment in the actual form or innovation used for learning purposes in the forms of experiment and discovery (De Jong & Van Joolingen, 1998). It gives a positive impact to the use of simulation in aiding the processes of learning and teaching, and although it has progressed impressively the effectiveness has still been doubted (Molenda & Sullivan, 2003). The effectiveness of simulation-aided learning not only relies on the form of simulation alone, but is also based on the simulation’s own implementation (Barton & Maharg, 2007; Bell & Smetana, 2008).

2. Problem Survey

The Graduate Detection Study 2010 reports that Malaysian Polytechnic Institutions has produced 15.4% from the total number of Malaysian Higher Learning graduates in 2010 with 68.9% of them from the technical fields (KPTM, 2011). The role played by polytechnics in supplying semi-skilled workers to the country and catering to the needs of the industry has propelled polytechnics to provide various fields of study, one of which is the Diploma in Information Technology majoring in Networking. The content of this course is integrated with the CISCO Professional certification. This initiative serves to be one of the efforts in producing workers who are skilled, marketable, also competent (Anuar & Ahmad Zamzuri, 2010), not to mention responding to the urge for semi-skilled workers in the area of computer-networking, information technology and communication (Ungku Harun Al’Rashid, 2004).

The formulation of this curriculum has somehow faltered, evident in poor results whereby the majority of the students had attained less than 3.00 point value and 100% had failed to obtained CISCO Professional Certificate in their first attempt (Anuar & Ahmad Zamzuri, 2010). Based on that information, a pilot study was carried out on lecturers concerning the effect of the Packet Tracer Simulation (PTS) adoption in eight polytechnics offering the said Diploma course or better known as DNS (Polytechnic Study Department., 2012). PTS has been developed by CISCO as software in aid of teaching and learning delivery. It prepares the situations of simulation, visualization, programming, evaluation and has the capability to produce networking technology learning in virtual networking environment through visual simulations (Packet Tracer Data Sheet, 2008).

Seeing that almost 50% of the professional certification questions come in the form of simulation (ICND1 & ICND2, 2010), and the use of the PTS is integrated in practical activities, the survey done concentrated on the perspective of the PTS capability as a catalyst to increase students’ understanding on the Switching and Routing course through the method of structured interview.
The selection of respondents revolved around lecturers who teach the *Switching and Routing* course; those who have the Cisco Certified Network Associated (CCNA) certificate as the prerequisite. The study findings gathered from eight Polytechnic lecturers are as follows:

Polytechnic Lecturer 1: CCNA, Senior Lecturer  
*PT simulation helps in the teaching and learning process but students are not able to fully utilize it. They only follow the steps in the "lab sheet", when they have completed and have successfully done it, but the purpose and how the concept is learned is not known by the students when being used. Students are not able to use "high order thinking skills" either perform the "troubleshooting" or laboratory activities. Routing protocol is often more difficult to be understood.*

Polytechnic Lecturer 2: CCNA, Program Head, Resource Lecturer (Computer Network)  
*Students are not able to answer the questions or execute any basic configuration instructions learned at the initial stages of the course; it seems as if the students have never learned them. It forces us to repeat and repeat the process, this is time-consuming. Students only manage to follow laboratory instructions, step-by-step but they fail to understand the concept or theory used in the laboratory activity. This problem is prominent for the topics like routing protocol, subnetting and ACL. Students only memorize the instructions or the theories learned without really knowing the actual time or circumstances that the instructions or theories should be applied.*

Polytechnic Lecturer 3: CCNA, Lecturer  
*Students are able to use the PT well, based on the steps given. However, should there be problems or malfunctioning network, students fail to detect any damage and perform repair work. The lecturer has to check every issue that occurs, although these issues often stem from trivial causes. The PT Simulation really helps only that the students find it difficult to relate the theory learned with the laboratory activities that have to be performed. Students also find it difficult to understand the routing protocol and ACL topics, due to the fact that both necessitate students to construct some particular statements in order to execute what is required out of the instructions.*

Polytechnic Lecturer 4: CCNA, Senior Lecturer  
*There has been no remarkable difference between students’ use of the PT simulation and the actual equipment. Laboratory activities can be done well by making reference to the lab sheet provided. Only a number of students have problems in doing the Skills Test, where they can only do it if they are helped, in some way. They are able to apply theories and lab activities but stumble when it comes to perform the troubleshooting; if they have problems, then normally the problems will be resolved with the lecturer’s assistance.*

Polytechnic Lecturer 5: CCNA, Senior Lecturer  
*Students have fun doing the PT Simulation as compared to using the actual equipment. The former helps in terms of starting the configuration, but it gets more and more difficult when they reach higher concept levels. The actual equipment has a better reputation in making students understand. If they follow the lab sheet they should be able to demonstrate the effectiveness of the PT simulation through a lot of practices, but they are not able to do their own troubleshooting. They prefer to ask their friends or lecturer, rather than thinking about ways to resolve the issue at hand. The flaw of the PT Simulation is actually very scarce. I think this issue is more apparent in certain topics like routing protocol, where the students find it hard to apply what they have learned.*

Polytechnic Lecturer 6: CCNA, Lecturer  
*In my opinion, students have no problem in using easy PT simulations. However, when laboratory activities are done, a lot of students only follow the laboratory instructions "step by step" until the end, when there is a slight change to the configuration, they begin to get stuck. Normally, students will be assisted by the lecturer, it appears that they are not able to use the theory learned to solve the issue. A difficult topic is perhaps, routing protocol especially EIGRP.*

Polytechnic Lecturer 7: CCNA, Lecturer  
*Students have fun using the PT, but initially, they have to be ‘pushed’ in order for them to use it more frequently. Practices can be followed if there are references available or the "lab sheet" otherwise students will find it hard to
do. Routing protocol takes a long time to be explained to the students—maybe there are a lot of configurations to be understood and they need to know when each configuration can be put to use.

Polytechnic Lecturer 8: CCNA, Senior Lecturer
I have this view that PT is easy to use if the students use it a lot. If it is only used in practical training, I think that it is not enough. Switching and Routing requires students to understand the networking theories beforehand, if they can fully grasp them only then they will know how to use them in the topology given. Learning the computer network does not only involve learning theories. Students will find it hard to use a theory especially in light of routing protocol because there are a lot of configurations and concepts that need to be understood first.

3. Discussion

As a whole, the findings from the interview indicate that the respondents agree with the PTS role that helps in the teaching and learning processes, yet there is a problem where the students find it difficult to apply the theories they have learned in the actual situations. The findings are also in agreement that the topic of routing protocol serves to be a difficult topic to understand. Based on the study by Anuar Hassan and Ahmad Zamzuri (2010), it was reported that 66.7% have stated that the most popular abstract topic that is also the most difficult to be taught by the lecturer is the topic routing protocol. This finding is also strengthened based on the Course Learning Outcome (CLO) which targets at the implementation and the capacity of the students to configure the routing protocol at the end of the course followed. The topic routing protocol comprises of 12 from 25 sub-topics which require students to master configuration skills. Based on this issue, what is demonstrated as a major weakness is his or her difficulty in understanding the abstract structure of programming and in applying it to the particular situations.

Based on the study by Stephen et al. (2011), a typical issue that often emerges for a student is when they find it a problem to understand the abstract programming and how to use it in actual circumstances. Programming stresses on the knowledge of “what” and “how”, as in what is the theory to be used and how it is to be used as stated by Mohd Nasir, Nor Azilah and Irfan Naufal, (2010). The findings also suggest that during the processes of teaching and learning, students are taught to analyze the problems and use a specific technique to state the resolution to the issue and confirm the solutions. Later on, students are required to change the solutions to a more specific programming language. Programming encourages students to make evaluation on their issues and encourages the processes of thinking, where this cognitive process enables them to transfer new problems to the skills on resolving the problematic situations that have been created (Mohd Nasir et al., 2010).

4. Conclusion

As the conclusion of study findings, it is found that DNS students have the difficulty in applying the theory learned with the actual situations. This difficulty is caused by the fact that the simulation learning method used has not played the supposed role it is expected to, as the catalyst to the learning effectiveness. This is due to the fact that the Switching and Routing course has a lot of programming elements in the syllabus. Simulation learning and the inclusion of the element of taxonomy engagement in the laboratory sheet in this course is anticipated to spur good, effective learning. Notwithstanding, this study has been strictly dedicated to the perspectives of the lecturers involved. Further studies need to be done for us to look into the issue through some different perspectives.

References


