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Adopting an Active Learning Approach for Teaching and Learning of Web Design Technology: A Guide for Effective Learning

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Abstract: *This paper presents an Action Research study to enhance student learning in the Web Design Technology course of Diploma Digital Technologies at Polytechnic Sultan Abdul Halim Mu'adzam Shah through the implementation of an active learning method. The study addresses the problems of varied experiences amongst students with web programming languages and computational thinking. The intervention involved implementing five approaches: pre & post-test, guided hands-on practice, project-based learning, collaborative coding projects/ gamification, and Interactive Flipbook. The idea and purpose behind active learning was to improve the student's capability for learning as well as their ability to think computationally. The study involved 64 4th semester students enrolled in the web design technology course. The study was conducted over 15 weeks using observation, interview, document analysis, and schema. The students that participated in the intervention and were evaluated utilizing formative assessments while doing their practical work resulted in favourable outcomes for all five approaches. According to the study's findings, notions of active learning can potentially improve students' learning capabilities and significantly enhance student learning outcomes, as shown by higher formative assessment scores and increased engagement in the learning process. In conclusion, active learning methods can effectively increase student learning outcomes in Web Design Technology courses and can be further explored.*

Keywords: *Action Research; Active Learning; Teaching and Learning; Web Design Technology*

1.0 INTRODUCTION

Action Research is a method that emphasizes continuous reflection and development as opposed to a final outcome (Bahja, M., & Shukla, M.,2019). This action research study focuses on enhancing student learning in the Web Design Technology course of Diploma Digital Technologies at Polytechnic Sultan Abdul Halim Mu'adzam Shah through the implementation of an active learning method. The study addresses the problems of varied experiences amongst students with web development languages and computational thinking. This research endeavors to cultivate cognitive abilities, fostering the development of critical thinking and computational proficiency. The ultimate goal is to integrate effective delivery methods into teaching and learning practices tailored to address the diverse issues that students may encounter. The course learning outcome aims student ability to achieve the following:

i. Construct the HTML, CSS, JavaScript, and jQuery in developing an interactive web page that can be published on a web browser.
ii. Practices good managerial skills and entrepreneurial mindset in developing an interactive web page.
iii. Demonstrate positive value and ethics in designing interactive web application interfaces that can be viewed in web browsers.

The intervention involved implementing of five active learning approaches. The idea and purpose behind active learning was to improve the student's capability for learning as well as their ability to think computationally. The study was conducted over 15 weeks using four instruments: observations, interview/discussion, scheme and document analysis. The students that participated in the intervention and were evaluated utilizing formative assessments had favorable outcomes for all five active learning activities. The subsequent sections explain these approaches.

2.0 PROBLEM STATEMENT

According to the researcher's teaching experience, observation, continuous assessment, and laboratory activities (formative assessment), the main issues faced by the student were unfamiliar with web design programming language (HTML, CSS, JAVASCRIPT & JQUERY) due to lack of experience and exposure to this course.

Moreover, the lack of computational thinking skills among students was the second problem affecting their understanding of the concepts in web design and development. These factors cause motivational deficits in learning this course.

The third issue is that students often encounter difficulties recalling the lines of code for designing interactive web applications during continuous and final assessments. They have to develop an interactive and responsive web application from scratch using HTML, CSS, JavaScript, jQuery and jQuery Mobile.

Most students rely on lecturers for guidance and instruction rather than exploring additional sources or engaging in additional practical exercises. It is vital to identify any learning issues that students may encounter in the syllabus, as well as any topics that may prove challenging for them to comprehend. This will enable the development and implementation of effective learning strategies. Such issues necessitate the active engagement of students in independent learning, fostering a sense of accountability, self-assurance, and autonomy in their learning pursuits. Given the circumstances, Active Learning approaches were determined to be the optimal method for attaining favourable learning outcomes. The subsequent sections explain these approaches.

3.0 METHODOLOGY

This study employed the action research method, as formulated by (Bahja M. et al., M; 2019), with minor modifications.

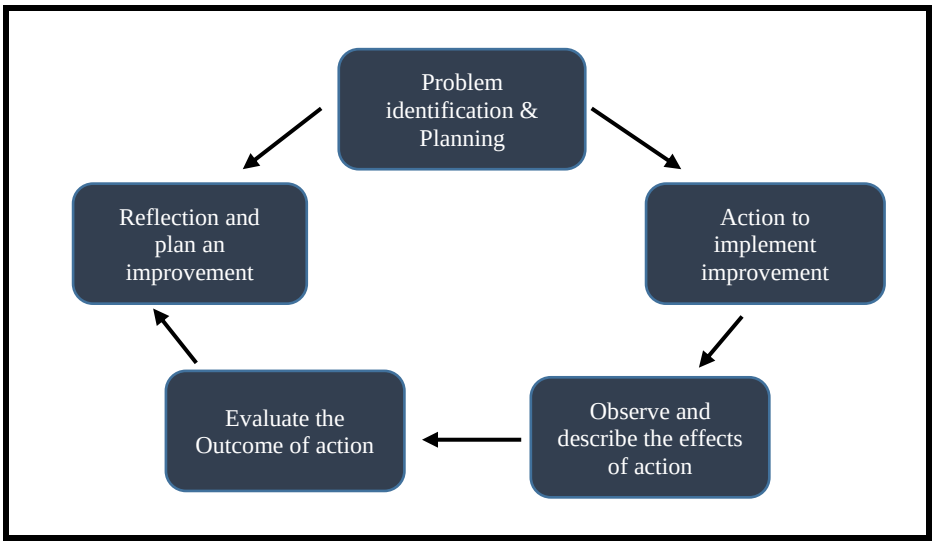

***Figure1**: Action Research Methodology*

Figure 1 depicts a diagram consisting of five stages for identifying problems and conducting action research through the implementation of five active learning approaches (formative assessments), The study examines the impact of online pre and post-tests, guided hands-on exercises, project-based learning, code collaborative activity, online gamification, and interactive flipbook on the learning and development process to Web Design Technology students. Action research is a recursive and cyclical process, wherein it repeats some process or is carried out in a different sequence. The main stages typically include planning, acting, observing and evaluating, and reflecting. The objective of Web Design Technology course is to enhance students' proficiency in constructing responsive and interactive web applications (client-side) using HTML5, CSS3, JavaScript, JQuery, and JQuery Mobile. They should be able to convert web-based applications to mobile web applications by the end of the course. The teaching and learning approach focuses on demonstrating web programming syntax (laboratory activities), with theoretical lectures explaining the concepts. The student was evaluated through continuous assessment and final assessment throughout the semester.

3.1 Action and Observe to Implement Improvement

A strategic approach was employed to integrate action research techniques into the teaching process to improve the skills and learning outcomes. The study involved 64 4th-semester students enrolled in the Web Design Technology course. The intervention of action research approaches is described below.

i. Pre and Post Quiz/Test

Prior to the lecture session, students undergo a pre and post-test to gauge their level of comprehension and knowledge. Online interactive platforms like Quizizz, FlexiQuiz, and CIDOS are used to conduct pre-and post-tests (implemented in Topics 1 – 3 of the syllabus). These platforms enhance students' engagement and motivation because it leverages elements like points, badges, leaderboards, challenges, and rewards. The top three students on the leaderboard will receive rewards from the lecturer. As a result of this activity, students become more prepared and focused on subsequent lecture sessions.

ii. Guided hands-on practice

Students are provided with step-by-step, hands-on lab activities. Guide students through creating the HTML structure for the web page, including header, navigation, headings, paragraphs, images, links, and footer (implemented in Topics 2-5). For each activity step, they have to run the code on the browser and view the output. After that, they were required to modify the layout and content, such as changing font style, font color, font size, etc., and answer additional exercises using the programming syntax (covered in Topics 2–5) they have learned according to their ingenuity.

iii. Project-based learning

Students are assigned web design projects that require them to apply their programming skills to create functional and visually appealing websites. They typically work individually. Throughout the project, students are encouraged to research, plan, design, code, test, and iterate their website designs and simulate the iterative development process.

iv. Code collaboration activity and online gamification

In gamification and code collaboration activity, students are assigned into groups of 2-3 members. They must complete lines of code by typing their answers on the Padlet platform. The fastest response time (as recorded on the Padlet) measures the winner.

v. Interactive flipbook

An interactive flipbook (created using Canva) is a digital version of a traditional flipbook, where pages are animated to simulate the flipping motion when the user interacts with it. This learning approach is used in the final phase of teaching and learning to prepare for students' final assessment. The flipbook includes interactive elements like clickable links, instructional videos for answering questions prepared by the researcher, a collection of syntax for each web page, and YouTube videos as additional sources. The Flipbook link is assigned to the students via the class group Telegram during Week 15.

4.0 DATA ANALYSIS AND FINDINGS

Data collection methods are approaches and procedures for acquiring information on research objectives (Konting, M. M., 1990). Typical data collection are surveys, interviews, observations, focus groups, experiments, and secondary data analysis (Hox, J. J., & Boeije, H. R., 2005). This research involved four instruments: observation, interview/discussion, and document analysis. It was conducted over 15 weeks to identify the students' problems and interests and analyze the gathered data.

4.1 Evaluate the Outcome of the Action

4.1.1 Observation

This process involves examining the situation or event and activities using a more systematic structured observation method (Lewis, D., 1972), which involves direct observing classroom interactions and practicing reflexivity. Direct observation of events happening in front of our eyes records behaviour in its natural surroundings (Ciesielska & Jemielniak, 2017) . The advantages of direct observation allow the researcher to see what people do. It collects data regarding where and when an event or activity takes place (Ekka, 2021). Students are assessed through randomly asked questions and their involvement during the lecture session

and laboratory activities. Moreover, students are observed through their ability to assist their peers in solving problems related to particular programming syntax.

4.1.2 Interview/Discussion

Interviews are the best method for exploring and obtaining detailed research information. According to Shanmugavelu et al. (2020), the verbal questioning method can help lecturers delve into the thoughts of students. The information obtained is rated and recorded. Students are assessed based on indirect verbal responses. Some of the questions asked include:

i. What elements are commonly used in the body section of HTML syntax?
ii. Show the display on the browser if the <body> tag is missing.
iii. What are the differences between inline, internal, and external CSS? Clarify.

As a result, most students successfully gave positive responses during the interview process, and they also expressed subtopics that they did not understand regarding the discussed topics. They also suggested that more practical exercises be provided after code demonstrations in lectures to enhance their understanding and enable them to remember the syntax easily.

4.1.3 Schema

The pre and post-test assessments include multiple-choice questions, true/false statements, fill-in-the-blanks, and drag-and-drop question formats. The pre-test is assigned to the learners before the online learning session begins. Pre-test provides a baseline measurement of students existing knowledge or understanding. The post-test is to assess their learning outcomes and any improvements. One of the evaluation criteria is the student's ability to accurately answer questions post-test after the lecture session with reference to a schema.

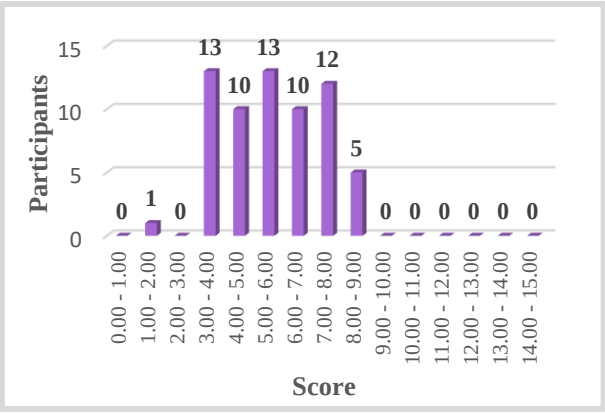

***Figure 2**: Student's Score (range) in Pre-Test 3*

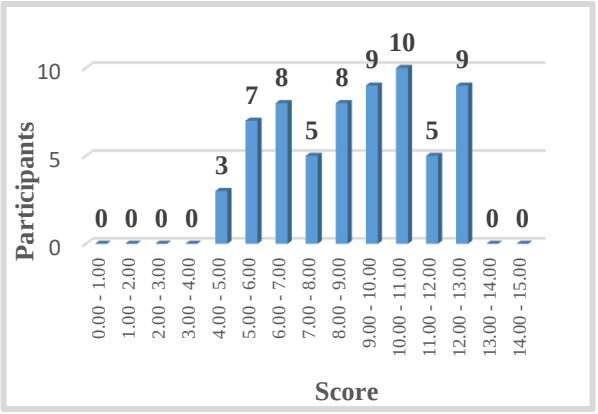

***Figure 3**: Student's Score (range) in Post-Test 3*

Figure 2 and Figure 3 depict the Student's Scores in Pre-Test 3 and Post-Test 3 for both classes (64 students). Based on the graphs, there is a highly significant change between the two tests. This indicates that the majority of students were able to grasp the topic after the lecture session. In the pre-test, one student obtained a score of 1-2, and the highest scores were limited to the range of 8-9. Nevertheless, the student's scores increased in the post-test, with the highest ranges being 11-12 and 13-14.

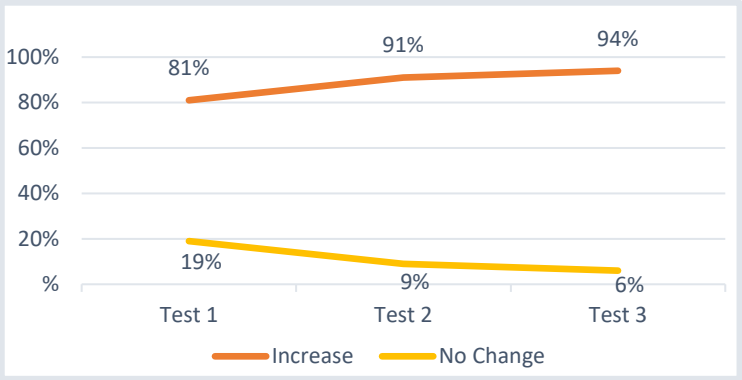

***Figure 4**: Percentages of Student's Score in Three Pre and Post-Tests*

Figure 4 illustrates the percentage distribution of student scores based on three pre- and post-tests. This percentage is calculated by comparing scores between pre and post-tests achieved by 64 students. On average, 11% of students showed no change in scores across all three pre- and post-tests. Meanwhile, 88% of students showed improvements in their knowledge or understanding after the learning session was conducted. Overall, there was an enhancement in student performance based on the three pre- and post-tests conducted, with scores showing an increase in Test 2 and Test 3 compared to Test 1.

4.1.4 Document Analysis (Laboratory Activity)

By engaging in guided hands-on practice activity and project-based learning, students can apply their theoretical knowledge of HTML, CSS, JavaScript, jQuery and jQuery Mobile to create a functional and responsive web page. They gained practical experience, reinforce their understanding of the concepts, and develop problem-solving skills in web development. The practical excersices (laboratory task) were evaluated using a rubric.

Regarding on the scores evaluated using the rubric, there is a significant difference in student performance (increase) when comparing between Labtask 1 to 2 and Labtasks 3 to 5, as well as Project 1 and Project 2. At the beginning of the semester, 13 female students in DDT4B appeared to have less interest, with low scores in both the pre and post tests. They struggled to

answer spontaneous question. Yet, these students have shown effort and interest, and their performance has improved starting from the fourth week of lectures, particularly when the teaching session focused on the second topic, Cascading Style Sheet (CSS). Surprisingly, six groups from DDT4B and five groups from DDT4C were able to produce Project 2, beyond expectations. Nonetheless, the assessment of the efficacy of the flipbook approach remains inconclusive as the final assessment remains in progress. The following are benefits of web design project-based learning:

i. Students gain practical experience by working on real web design projects, allowing them to apply the theoretical concepts they learn in a hands-on manner.
ii. Students develop critical thinking and problem-solving skills as they encounter challenges and find creative solutions to design and programming issues during the project.
iii. Encourages collaboration and teamwork, as students often work in groups.
iv. Students have the opportunity to showcase their creativity and innovation by designing unique websites and incorporating interactive elements, user experience enhancements, and engaging visuals.

4.2. Reflection and Plan an Improvement

In summary, the five approaches that incorporated active learning concepts yielded positive results in enhancing students' experiences with web-based programming languages and their computational thinking skills. Based on the finding, it is planned to implement these Active Learning techniques in future Web Design Technology concept classes. The implementation of active learning techniques has yielded favorable outcomes. Moreover, this approach can be consistently utilized to identify emerging issues and challenges and effectively address them through this highly effective method of learning and instruction.

5.0 DISCUSSION AND CONCLUSIONS

In conclusion, adopting an active learning approach for teaching and learning Web Design Technology has proven to be effective in promoting meaningful and engaging learning experiences. By incorporating hands-on activities, collaborative projects, and interactive elements, students are actively involved in the learning process, allowing them to develop a deeper understanding of web design concepts and skills. The active learning approach

encourages student participation, empowers them to become active learners, critical thinking, and problem-solving skills, which are essential in the field of Web Design Technology. It promotes creativity, collaboration, and effective communication among students, fostering a dynamic and stimulating learning environment. Furthermore, the use of various online tools, platforms, and resources enhances the accessibility and flexibility of learning, enabling students to explore and experiment with Web Design Technology at their own pace. The integration of multimedia elements, such as videos and interactive content, provides visual and interactive aids that facilitate comprehension and retention of information.

REFERENCES

Bahja, M., & Shukla, M. An Active Learning Approach for Teaching Web Development-Action Research Study.

Ciesielska, M., Boström, K. W., & Öhlander, M. (2018). Observation methods. *Qualitative methodologies in organization studies: Volume II: Methods and possibilities*, 33-52.

Ekka, P. M. (2021). A review of observation method in data collection process. *IJRTI International Journal for Research Trends and Innovation*, *6*(12).

Hox, J. J., & Boeije, H. R. (2005*). Data collection, primary versus secondary.*

Isomöttönen, V., & Tirronen, V. (2016). Flipping and blending—an action research project on improving a functional programming course. *ACM Transactions on Computing Education (TOCE)*, *17*(1), 1-35.

Konting, M. M. (1990). Kaedah penyelidikan pendidikan. Dewan Bahasa dan Pustaka.

Lewis, D. (1972). Psychophysical and theoretical identifications. *Australasian Journal of Philosophy*, *50*(3), 249-258.

Liang, Z. (2019, December). Enhancing active learning in web development classes using pairwise pre-and-post lecture quizzes. In *2019 IEEE International Conference on Engineering, Technology and Education (TALE)* (pp. 1-8). IEEE.

Shanmugavelu, G., Ariffin, K., Vadivelu, M., Mahayudin, Z., & R K Sundaram, M. A. (2020). Questioning Techniques and Teachers' Role in the Classroom. Shanlax International Journal of Education, 8(4), 45–49. https://doi.org/10.34293/education.v8i4.3260.

White, P. J., Larson, I., Styles, K., Yuriev, E., Evans, D. R., Rangachari, P. K., ... & Naidu, S. (2016*). Adopting an active learning approach to teaching in a research-intensive higher education context transformed staff teaching attitudes and behaviours. Higher Education Research & Development*, *35(3), 619-633.*