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Development and Assessment of Web Application for Industrial Technological Education

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ABSTRACT: This research developed a Web Application for Industrial Technological Education (WAITE) as online platform for undergraduate and graduate studies. It followed the Analysis, Design, Development, Implementation, and Evaluation (ADDIE) model. The following is a summary of the study's findings: 1. the WAITE was planned based on the needs of teachers and students of flexible learning; 2. the researcher designed the WAITE's context diagram and use-case scenario as well as to considered the device, internet connectivity and available web browser of the users; 3. in the development, the researcher utilized Notepad++ software as the text editor of PHP and for the database is MySQL which is incorporated on XAMPP application.; 4. in terms of implementation and evaluation, the researcher gathered IT professionals, teachers, and students to test its technical characteristics and instructional use respectively, they gave the WAITE a very high rating. The positive comments and suggestions given by the respondents show the endorsement of this scrupulous niche for the use of technology in pedagogy

KEYWORDS: Assessment, Development, Industrial Technological Education, Pedagogy, Web Application

INTRODUCTION

In accordance with the pertinent provisions of Republic Act (RA) No. 7722, otherwise known as the "Higher Education Act of 1994", Republic Act No. 11469, otherwise known as the "Bayanihan to Heal as One Act", and by virtue of Commission en Banc (CEB) Resolution No. 412-2020, series of 2020, the Commission on Higher Education (CHED) hereby adopts and promulgates the following Guidelines on Flexible Learning (FL) to be implemented by public and private Higher Education Institutions (HEIs) (Ched.gov.ph, 2020). According to CHED Memorandum No. 04 series of 2020, the HEIs are encouraged to maximize the use of technology to support the teaching-learning process. Further, the development of websites and/or Learning Management System (LMS) and Information and Communications Technology (ICT) -based assessment tools has been recommended.

A website is a collection of related material that contains text, images, and may also include video, audio or other media (Mediatemple.net). Normally, a website can be as basic as a few static pages or as complex as a number of web

applications running concurrently and anything in between. According to Meri-Yilan and Koruyan (2020), the use of ICT in education has revolutionized learning. Shifting beyond traditional mode of education, the integration of ICTs has become an advantage for students at tertiary education when used for the right purpose to enhance learning.

At present, learners belong to the Web 2.0 technology. This technology can be defined as a set of next – generation Internet technologies (Wolcott, 2008) which mean that such internet applications allow sharing and collaboration opportunities to people and help them express themselves online (Lipika, 2016). At present, learners are considered as digital natives of our generation and become more tech savvy. Considering the characteristics of 21st century learners such as; global citizens, thinking creatively and critically, communicate and collaborate with others, and digital literacy (Breed, 2019). Social media usage and access to the web has made students more aware of their place in a diverse world.

Integration of Technology has an important role in pedagogy particularly in flexible learning, as Peel (2020) defined pedagogy as the study of teaching methods, including the aims of education and the ways in which such goals may be achieved. Pedagogy in education can either be teacher-centered or learner-centered with a low-tech or high-tech approach (Cole, 2019). Okojie et.al (2018) stated that technology integration should incorporate the technological skill and ability to use pedagogical knowledge as a base for integrating technology into teaching and learning; it needs to be effectively integrated across all key learning areas (Chalich, 2015).

Müller et.al (2018), in their paper, cited that with flexible learning, students gain access and flexibility with regard to at least one of the following dimensions: time, place, pace, learning style, content, assessment or learning path. Flexible learning increases access to higher education, particularly for traditionally undeserved students (Andrade & Alden-Rivers, 2019). Synchronous and asynchronous learning is a form of flexible learning which led to distance learning. According to Littlefield (2018), in the world of online education, often known as distance learning, classes can be asynchronous or synchronous. Wasdahl (2020) said on his paper, distance learning can occur in separate physical spaces which can take three forms, such as synchronous, asynchronous or combination of both or hybrid. The researcher think that all of this is can be done through the development of web application.

Web Application refers to dynamic website which offers the interaction of the user within the system. It is a computer program that utilizes web browsers and web technology to perform tasks over the internet (Gibb, 2016), and it is an application program that is stored on a remote server and delivered over the internet through a browser interface (Rouse, 2019). Espada (2020) stated that web application is interactive programs that store and manipulate data. Kumar et.al (2016) said that web applications have grown very unexpectedly in recent years due to different methodologies used in web application development. According to Johnston (2020), the development of web application is the procedure engaged with creating a web application. It deals on interacting with the

web browser than those standard processes. Web apps are dynamic web sites combined with server-side programming which provide functionalities such as interacting with users, connecting to back-end databases, and generating results to browsers (Kohan, 2020).

The researcher as an HEI educator felt there's a need for technology amalgamation in education to comply with the guidelines presented in CMO no.4 s2020 and to cater the 21st century learners. The developed Web application of the researcher can be utilized in undergraduate and graduate studies of industrial-technological education.

METHODOLOGY

This research utilized a developmental research design. Richey & Nelson (2001) said that it is the systematic study of designing, developing and evaluating instructional programs, processes, and products that must meet the criteria of internal consistency and effectiveness. In this study, the developed product is the Web Application for Industrial Technological Education (WAITE).

The evaluation of the WAITE was done by 70 respondents. The distribution was as follows: 15 teachers and 50 students from the College of Industrial Technology and Graduate School of Nueva Ecija University of Science and Technology, and 5 IT professionals, in Cabanatuan City.

The questionnaire was used to evaluate the WAITE as to its instructional use and technical characteristics, such as: functionality, efficiency, reliability, usability, maintainability and portability. The instrument was researcher-made. The reliability of the instrument was calculated using Cronbach's alpha. The Cronbach's value is 0.894 which indicates the instrument is very reliable.

RESULTS AND DISCUSSIONS

This study followed the ADDIE Model in developing the WAITE

1.1. Analysis

In this phase of the development, the researcher takes into consideration all the factors needed for the development of the web app like the Context Diagram (CD) and Use-Case Scenario (UCD) respectively. The analysis stage deals with the UCD of WAITE; a use case diagram is a dynamic or behavior diagram in Unified Modeling Language (UML). Use case diagrams model the functionality of a system using actors and use cases (Smartdraw.com, 2020). Furthermore, UCD are valuable for visualizing the functional requirements of a system that will translate into design choices and development priorities.

1.2. Design

In this phase of the development, the researcher conceptualized how the audio, text, image and video learning materials be uploaded in WAITE's environment considering how the end users shall access them. Further, assessment tool was also considered in this phase of development. Moreover, the researcher also considered how to access WAITE once it was uploaded in the internet. WAITE's is accessible via web browsers like Google Chrome, Microsoft Edge, Mozilla Firefox, Opera and Apple Safari. Electronic communication devices like; desktop and laptop computers, tablets and smartphones were utilized as a medium between the user and the system as long as they have Internet connectivity through dial-up telephone lines, broadband, and wireless fidelity and data.

1.3. Development

In this phase of the development, it is the actual programming of the developed web application. The researcher utilized Notepad++ software as the text editor of PHP programming language, while for its database is MySQL which is incorporated on XAMPP application. Figure 1 shows screenshot of the sample of PHP program coding on Notepad++, while figure 2 shows screenshot of the sample database of WAITE using MySQL on XAMPP platform.

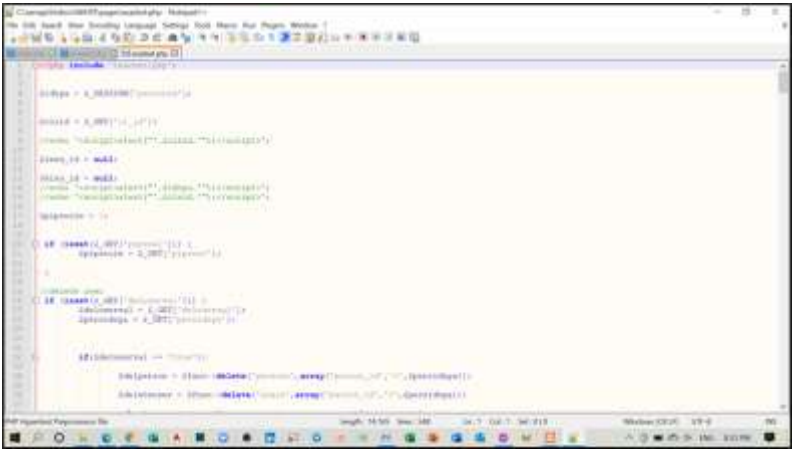

Figure 1: Screenshot of PHP Program Coding on Notepad++

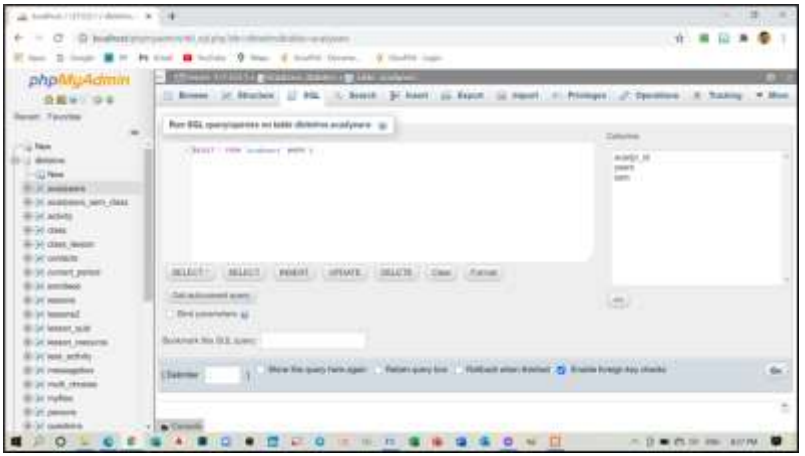

Figure 2: Screenshot of WAITE Database using MySQL

1.4 Implementation

One of the most crucial stages of product development is testing, where the developed web app was been tested by the researcher itself before deploying it to its intended respondents for the evaluation. The researcher tested WAITE's accessibility when uploaded in the internet. Four factors were considered during the accessibility testing: first, the web browser utilized to access it. Second, electronic communication device used to access it. Third, the internet connection and lastly, the operating system of the electronic device. After series of testing, WAITE is now properly deployed to its respondents which is considered as its end-users. Figure 3 shows WAITE is running on different browsers, while figure shows that the developed web app was scrutinized, utilized and evaluated by the respondents.

Figure 3. WAITE's tested on different web browsers and electronic device

Figure 4. WAITE's tested and evaluated by the respondents

1.5. Evaluation

The table shows the result of evaluation done by the respondents. Table 1 shows the evaluation summary of the technical characteristics such as functionality, reliability, usability, efficiency, maintainability and portability done by the IT processional respondents. On the other hand, table 2 show the result of the assessment result done by the teacher and student respondents on WAITE's instructional use.

Table 1: Summary of Assessment on WAITE' Technical Characteristics

Technical Characteristics	*Weighted Mean*	*Verbal Description*
Functionality	4.30	Excellent
Reliability	3.80	Very Satisfactory
Usability	4.50	Excellent
Efficiency	4.30	Excellent
Maintainability	4.10	Very Satisfactory
Portability	4.87	Excellent
OVERALL WEIGHTED MEAN	*4.31*	*Excellent*

Table 2: Summary of Assessment on WAITE' Instructional Use

Respondents	*Overall Weighted Mean*	*Verbal Description*
Teacher	4.88	Excellent
Students	4.62	Excellent
OVERALL WEIGHTED MEAN	*4.75*	*Excellent*

CONCLUSIONS

Based on the results of the study, the following conclusions are drawn:

1. The Web Application for Industrial Technological Education (WAITE) was developed using the ADDIE model

2. The WAITE was rated excellent by the teachers and students alike based on its instruction use and by the IT professionals on its technical characteristics based on ISO 9126-1 standards.

3. The overwhelmingly positive comments and suggestions given by the respondents show the endorsement of this scrupulous niche for the use of technology in pedagogy, specifically, for online learning management systems like the WAITE.

REFERENCES

Andrade, Maureen Snow & Alden-Rivers Bethany (2019) "Developing a Framework for Sustainable Growth of Flexible Learning Opportunities" Accessed on 16 August 2020 from https://doi.org/10.1080/23752696.2018.1564879

Breed, Cathy (2019) "Characteristics of 21st Century Learner" Accessed on 10 August 2020 from https://blog.kamiapp.com/characteristics-of-21st-century-learners/

Chalich, Zeina (2015) "Integrating Technology with Classroom Pedagogy – Accelerate Student Learning" Accessed on 25 September 2020 from https://educationtechnologysolutions.com/2015/08/integrating-technology-with-classroom-pedagogy-accelerate-student-learning/

Ched.gov.ph (2020) "Development of Websites and/or LMS and ICT-based Assessment Tools" Accessed on 10 August 2020 from https://ched.gov.ph/wp-content/uploads/CMO-No.-4-s.-2020-Guidelines-on-the-Implementation-of-Flexible-Learning.pdf

Cole, Kristen (2019) "Pedagogy in Education: More Than a Buzzword" Accessed on 24 September 2020 from https://www.schoology.com/blog/pedagogy-education-more-buzzword

Espada, Diego (2020) "The Web Application Development Process" Accessed on 20 August from https://www.bairesdev.com/blog/web-application-development-process/

Gibb, Robert (2016) "What is Web Application?" Accessed on 20 August 2020 from https://blog.stackpath.com/web-application/

Johnston, Joe (2020) "A Beginners Guide to Web Application Development" Accessed on 13 August 2020 from https://www.budibase.com/blog/web-application-development/

Kohan, Bernard (2020) "Guide to Web Application Development" Accessed on 20 August 2020 from https://www.comentum.com/guide-to-web-application-development.html

Kumar, Shipra Ravi, Sharma, Ravi & Gupta, Keshav (2016) "Strategies for Web Application Development Methodologies" Accessed on 20 August 2020 from https://ieeexplore.ieee.org/abstract/document/7813710

Lipika (2016) "What is Web 2.0 Technology" Accessed on 11 August 2020 from https://www.znetlive.com/blog/web-2-0/

Littlefield, Jamie (2018) "The Difference between Synchronous and Asynchronous Distance Learning" Accessed on 16 August 2020 from https://www. thoughtco.com/synchronous-distance-learning-asynchronous-distance-learning-1097959

Mediatemple.net (2020) "What is a Website" Accessed on 11 August 2020 from https://mediatemple.net/community/products/all/204403954/what-is-a-website

Meri-Yilan, Serpil and Koruvan, Kasim (2020) "ICT-based Assessment, Methods, and Programs in Tertiary Education" Accessed on 11 August 2020 from https://www.researchgate.net/publication/341387752_ICT-Based_Assessment_ Methods_and_Programs_in_Tertiary_Education

Müller, Maximilian, Claude, Mueller, Stahl, Michael & Alder, Mark (2018) "Learning Effectiveness and Students' Perceptions in a Flexible Learning Course" Accessed on 16 August 2020 from https://doi.org/10.2478/eurodl-2018-0006

Okojie, Mabel CPO, Olinzock, Anthony A., & Okojie-Boulder, Tinukwa C. (2018) "The Pedagogy of Technology Integration" Accessed on 24 September from https://doi.org/10.21061/jots.v32i2.a.1

Peel, Edwin A. (2020) "Definition of Pedagogy" Accessed on 30 October 2020 from https://www.britannica.com/science/pedagogy

Richey, Rita C. & Nelson, Wayne A. (2001), "Developmental Research" Accessed on 26 September 2020 from http://members.aect.org/edtech/ed1/42/index.html

Rouse, Margaret (2019) "Web Application Development" Accessed on 13 August 2020 from https://searchcloudcomputing.techtarget.com/definition/web-application-development

Smartdraw.com (2020) "Definition of Use Case Diagram" Accessed on 7 October 2020 from https://www.smartdraw.com/use-case-diagram/

Wasdahl, Alex (2020) "Synchronous vs. Asynchronous Learning: Strategies for Remote Environments" Accessed on 16 August 2020 from https://ssidp.ucla.edu/wp-content/uploads/sites/54/2020/08/Synchronous-vs-Asynchronous-Learning-Strategies-for-Remote-Environments.pdf

Wolcott, Mike (2008), "What is Web 2.0?" Accessed on 11 August 2020 from https://www.cbsnews.com/news/what-is-web-20/

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