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Laborapparatus: A Student Guide Website About Laboratory Apparatus

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ABSTRACT: This research capstone project was conducted to develop a website using the Wix Website Builder that comprises common laboratory apparatuses found in biology laboratories, chemistry laboratories, and physics laboratories. A total of 37 respondents was determined using purposive sampling: 15 High School Students, 15 IT Experts, and 7 Science and Research Teachers. The independent variable of this study is the level of acceptability in terms of content, design, and functionality, and the dependent variable is Laborapparatus: A Student Guide Website about Laboratory Apparatus. The researchers made a questionnaire to gather data on both variables. Frequency count, sum, percentage, and mean were used as the statistical tools in this study. Overall results showed that the level of acceptability of the website in terms of content, design, and functionality among the three groups was under the description "Very Highly Acceptable." The "Very Highly Acceptable" description proves that the website was found beneficial by the respondents because they have gained knowledge, as the website encompasses pictures, videos, and information about the chosen different laboratory apparatuses found in biology laboratories, chemistry laboratories, and physics laboratories.

KEYWORDS: Laboratory Apparatus, Biology Laboratory, Chemistry Laboratory, Physics Laboratory, Student guide Website

Introduction

Laboratory equipment can have harmful side effects if it is not used appropriately. It is vital to know how to securely operate all laboratory equipment to make a safe working setting and prevent various kinds of accidents (Watson, 2017). The concepts like open universities and distance learning in education are now becoming extensively used. Nevertheless, the teaching of Science, Technology, and Engineering are still comparatively late in terms of using new technological methods, mainly for online distance learning, because of the nature of the subject field. The cause for this inconsistency lies in the circumstance that the said fields frequently need laboratory activities to provide practical experience and actual skill accomplishment. Thus, virtual laboratories can be used for non-robotic engineering and other scientific uses to share several of the same learning methods (Potkonjak, 2016).

Virtual laboratories, which are available through the internet, are intended to stimulate real experiments and can use less instructional time, decrease reliance on hazardous, complex, expensive equipment, as well as letting students practice complex research that might not then be probable in a classroom setting of high schools. Furthermore, the usage of virtual laboratories can bid an appealing instructional medium, one to which numerous pupils of the digital age are well-accustomed, in response to influence towards the implementation of further educational technology in science classrooms (Oser, 2013). Flowers et. al (2011), as cited by Flowers (2011), stated that virtual laboratories are instructional methods that encompass technology-mediated teaching. It aims to facilitate knowledge on the utilization, purpose, or function of experimental procedures or scientific techniques. The enactment of virtual laboratories in science courses can improve teaching critical-thinking skills, enhance problem-solving skills, and understanding the lecture material.

According to the result of the study conducted by Alneyadi (2019), virtual laboratories have a reasonable effect on the skills, attitudes, knowledge, and achievement of the students, as well as innovation. It also increased the engagement, achievement, and motivation of the students. Dyrberg et. al (2016) conducted a study that assessed the self-efficacy, motivation, and attitude of the students from a pilot study when using the Labster, a virtual laboratory program. Interactive learning regarding the operation of relevant apparatuses, including the ability to adjust parameters and production of results, procedures, and workflows of biochemical and biological experiments, are allowed by the program. Results showed that the pre-laboratory preparation of the students can be potentially enhanced by virtual laboratories.

The key purpose of this research capstone project was to develop a website that contains common laboratory apparatus found in biology laboratories, chemistry laboratories, and physics laboratories. This website can provide various benefits for students, teachers, and laboratory supervisors since studies regarding the effectiveness of virtual laboratories with positive outcomes are growing. This study will potentially contribute to the field of science to help

improve the knowledge of the science and research teachers and especially the students since they wouldn't have a chance to visit a laboratory at present about the common laboratory apparatus found in three different laboratories. In addition to this, this website will provide information and pictures about the various apparatuses so that the individuals who will use and visit the site will probably gain and improve their knowledge.

Statement of the Problem

The research capstone project entitled "Laborapparatus: A Student Guide Website about Laboratory Apparatus" was conducted in order to provide a website that contains information about the different types of laboratory apparatus as well as their uses. The main purpose of this project was to provide guidance and knowledge as well as to build familiarity with the different laboratory apparatus.

Specifically, the project sought to answer the following questions:

1.) What is the level of acceptability of "Laborapparatus: A Student Guide Website about Laboratory Apparatus" among high school students, in terms of:

a. Content

b. Design

c. Functionality

2.) What is the level of acceptability of "Laborapparatus: A Student Guide Website about Laboratory Apparatus" among Science and Research Teachers, in terms of:

a. Content

b. Design

c. Functionality

3.) What is the level of acceptability of "Laborapparatus: A Student Guide Website about Laboratory Apparatus" among IT Experts, in terms of:

a. Content

b. Design

c. Functionality

Methodology

Research Design

The research design used in the study was Research and Development (R&D) Design. It is defined as a creative and systematic work wherein the formation of new knowledge regarding new and current products or processes will be administered. R&D Design will produce new knowledge which will be employed in building new-fangled materials or products and as well as to modify and innovate the existing ones (Luenendonk, 2019). This research design was administered because the study used existing information about the different types of laboratory apparatus which will help students or anyone who needs it.

The independent variable of the study was the level of acceptability in terms of content, design, and functionality while the dependent variable was the Laborapparatus: A Student Guide Website about Laboratory Apparatus. The variables in the study shows that the level of acceptability in terms of different aspect affects the Laborapparatus: A Student Guide Website about Laboratory Apparatus. The statistical tools used in the study were frequency count, sum, percentage, and mean.

Participants

The participants of this study were 15 high school students, 7 Science and Research teachers, and 15 IT Experts. The participants were selected through Purposive sampling. The method Purposive sampling may also be referred to as expert or selective sampling as it aims to select samples that can represent a given population logically. According to Stephanie Glen from StatisticsHowTo (2015), it is a non-probability method of sampling which relies on the judgement and knowledge of the researcher in selecting a sample based solely on the need of the study.

Table 1

Distribution of Participants

Participants	N	%

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High School Students	15	40.54
Science and Research Teachers	7	18.92
IT experts	15	40.54
Total	37	100

Data-Gathering Instrument

The researchers prepared a questionnaire, entitled — Laborapparatus: A Student Guide Website about Laboratory Apparatus Checklist was as the primary data collecting tool of the research capstone project. The purpose of this questionnaire was to determine the level of acceptability of Laborapparatus: A Student Guide Website about Laboratory Apparatus in terms of content, design, and functionality. This data collecting tool was suitable for the study because it can gather comparative information regarding the topic from the respondents.

The questionnaire consists of favorable statements, which were in accordance with the criteria on the level of acceptability of the website namely: content, design, and functionality. There were 5 statements in each criterion, having a total of 15 statements. Moreover, a Comments and Suggestions section was also included in the questionnaire to gather the recommendations of the participants about the website.

The validated checklists were then distributed to the participants of the study for the evaluation of the website. During the assessment, the researchers presented the content, features, and design of the website.

The questionnaire was responded using a 5-point Likert Scale:

Scaling	Description
5	Strongly Agree
4	Agree
3	Neutral
2	Disagree
1	Strongly Disagree

The means were arbitrarily categorized as follows:

Mean	Description
4.21 - 5.00	Very Highly Acceptable
3.41 – 4.20	Highly Acceptable
2.61 – 3.40	Acceptable
1.81 – 2.60	Less Acceptable
1.00 – 1.80	Least Acceptable

The results were then converted into quantitative data and were subjected to statistical analysis.

Results and Discussions

Level of Acceptability of Laborapparatus in terms of Content, Design, and Functionality to the High School Students

Based on the gathered information after the survey conducted for students with any of the following subjects, Biology, Chemistry, and Physics, the website has an overall mean score of 4.54 which is interpreted as “very highly acceptable.” in terms of the content, design, and functionality. Content has a M=4.67 which is interpreted as “very highly acceptable”, Design which has a M= 4.44 which is interpreted as “very highly acceptable” and lastly, Functionality which has a m= 4.51 and is also interpreted as “very highly acceptable”.

According to the result of the survey administered, students had the highest mean among the three categories of respondents as they evaluated the application and answered the survey. To emphasize, the responses of the students depicts that the student guide website for Laboratory apparatus is “Very Highly acceptable” in every variable namely, content, design, and functionality with an overall mean of 4.54 which is interpreted as “Very Highly Acceptable”.

Based on the table, the results show that according to the students’ preferences and evaluation, the graphics used in the website was appropriate and helpful since it was effective in conveying the information that was being expressed. There was also a high acceptance on the quality of data that they can acquire when they view the website. In addition, students also agree with the accessibility of the website whether the users utilize a smartphone or a personal computer. From the three categories of respondents, the students show the most acceptance to the website. As being exposed to the fast evolving and emerging technologies, students were mostly concerned with the consistency and the loading

speed of the website, as well as the aesthetics which includes the color scheme used in the website to align to its purpose and function of conveying necessary information. Students are also familiar with the content of the website as they are the ones taking classes regarding the subjects included in the student guide website specifically, Biology, Chemistry, and Physics.

Based on how the respondents assessed the website, Content ranked the highest in acceptability with a m=4.67 compared to the other two variables due to the fact that students are much more into looking at graphics, the comprehensibility of the statements included in the website, as well as the range and validity of the data that is being carried through the website. The students were not very specific with the complex and technical matter which might be considered as a lapse for the website. Students focused on the familiarity of the instruments and their background knowledge regarding it.

The survey results also showed that Functionality followed as the variable with the second highest mean and is interpreted as "Very Highly Acceptable", since the students are interested and hooked on websites that could be easily navigated using their garnered knowledge on how to use even complicated websites and applications. Students emphasized on the simplicity of the website and how it can function according to its purpose, be manipulated with ease, and used for educational purposes.

Design had the lowest mean score but is still interpreted as "Very Highly Acceptable". The student respondents were very precise with the fact that there is still room for improvement when it comes to the layout of the website and this includes the fonts used, spacing, buttons, vector arts, interface, and the unity of the theme of the website as a whole.

Generally, the student guide website for Laboratory Apparatus was rated and interpreted as "Very Highly Acceptable" mainly because of how the information regarding the different laboratory apparatus were helpful and appropriate for learning especially those without having the chance to get to see the apparatus face to face and know its functions. It is also highlighted that the website is accessible both for users of smartphones and personal computers.

The result of this study is aligned with the study of Sabasales (2018), as the findings of the study state that there is a statistical difference in an experimental group exposed to virtual laboratories and it significantly improved the academic performance of students in Physics, specifically as compared to students that did not have the virtual laboratory experience.

Table 2

Means of the Level of Acceptability of Laborapparatus to Student in terms of Content, Design, and Functionality.

Variables	Mean	Description
Overall	4.54	Very Highly Acceptable
Content	4.67	Very Highly Acceptable
Design	4.44	Very Highly Acceptable
Functionality	4.51	Very Highly Acceptable

Level of acceptability of Laborapparatus Website in terms of Content, Design, and Functionality to Science and Research Teachers

Based on the results gathered from the responses of Research and Science Teachers, Laborapparatus Website in terms of content, design, and functionality has an overall M= 4.43 and interpreted as "very highly acceptable". In terms of the different criteria, design has the highest level of acceptability with a M= 4.63 followed by content with a M= 4.57. Both design and content are interpreted as "very highly acceptable", while functionality has a M= 4.09 and interpreted as "highly acceptable".

Overall, the results in table 3 shows that Science and Research Teachers considered Laborapparatus as a very highly acceptable website in guiding students regarding laboratory apparatus. Specifically, the data indicates that Laborapparatus is very highly acceptable in terms of content, design, and functionality.

Furthermore, the data shows that the research and science teachers rated the Laborapparatus as very highly acceptable and it has the second highest mean score among the set of respondents. They found the website well organized and displayed. It shows a proper content, a good visual design, and it is also functional and accessible for the respondents. They rated the website's content as very highly acceptable as it shows appropriate and credible information. The data that were presented also came from reliable sources and are free from errors both grammatically and mechanically. The science and research teachers prove the validity of the data presented in the website as they are the one who are the most knowledgeable regarding the content.

Similarly, the design was also rated as very highly acceptable. The data indicates that science and research teachers had the highest mean score for design compared to the other groups of respondents. This implies that they found the

website visually fine. The respondents considered the color scheme to be appropriate as it aligns with the website's purpose and function. The appearance of a pleasant feature as well as a good user interface is also noticeable. The elements that were present on the website such as the layout, layers, and spacing are rationally displayed making the website appear neat and easier to understand.

Moreover, the respondents also considered functionality and it has the lowest mean among the three but regardless of that it still fits under the descriptor, "highly acceptable". They pinpoint its usefulness and accessibility both in smartphones and personal computers. The simplicity of the website also leads its way into becoming very user friendly. They also suggested some improvements such as to make the website's loading speed quicker and to have a faster user response.

In general, research and science teachers considered the Laborapparatus website as very highly acceptable as it reached its main goal which is to guide students regarding laboratory apparatus as well as their uses. Its usefulness was very evident for teachers especially during these times wherein they can't teach their students in an actual laboratory setting. Aside from that it is also beneficial for those teachers who teach in a school without a proper laboratory classrooms and apparatuses. The result of this study conforms with the study conducted by Aljuhani et.al (2018), as it was stated in the study that virtual laboratories help in the enhancement of learning as well as the efficient collaboration of teachers and students.

Table 3

Means of Level of Acceptability of Laborapparatus to Science and Research Teachers in terms of Content, Design, and Functionality

Variables	Mean	Description
Overall	4.43	Very Highly Acceptable
Content	4.57	Very Highly Acceptable
Design	4.63	Very Highly Acceptable
Functionality	4.09	Highly Acceptable

Level of Acceptability of Laborapparatus in terms of Content, Design, and Functionality to IT Experts

Based on the gathered results by the researchers, Laborapparatus has an overall overall M=4.23 in terms of content, design, and functionality, which is interpreted as "very highly acceptable". The collected data also shows that content has the highest level of acceptability with M=4.39 and interpreted as very highly acceptable. It is followed by functionality with M=4.19 and interpreted as highly acceptable. Design comes last with M=4.11 and interpreted as highly acceptable.

Overall, based on the results found on table 4, IT experts considered Laborapparatus as a very highly acceptable laboratory apparatus guide website with an overall mean score of 4.23. To be precise, the respondents rated the Laborapparatus website's content to be very highly acceptable. Meanwhile, the IT experts evaluated the design and functionality of the website to be highly acceptable.

To elaborate more, out of the three criteria, IT experts evaluated content to be the highest. Content has the highest mean rating due to quality content. The website contains accurate information about the laboratory apparatus, the photos included were taken by the researchers themselves, and the website also holds a lot of additional information about the apparatus such as videos on the proper handling of the apparatus.

Moreover, the IT experts rated the functionality of the website as second highest out of the three given criteria. The mean of functionality is described as highly acceptable. One of the reasons entailed in this result is because of the website's availability to different gadgets. IT experts and other users were able to access the laboratory apparatus guide website using their mobile phones, tablets, personal computer, desktop, or laptop.

In addition to this, the website's design was rated by IT experts to be the third highest among the three criteria. The design of the website is described as highly acceptable based on the calculated mean from the given rating of the IT experts. This could be because of the fact that the layout of the website is from a ready-to-use website template. However, this could be improved more based on the given feedbacks by the IT experts regarding the design of the website.

The results of this study conform to the study conducted by Hirschfeld and Thielsch (2019). The study stresses out that the content of the website is primarily important across the World Wide Web. This is because the users examine the website's clarity, likeability, informativeness, and credibility.

Table 4

Means of Level of Acceptability of Laborapparatus to IT Experts in terms of Content, Design, and Functionality.

Variables	Mean	Description
Over All	4.23	Very Highly Acceptable
Content	4.39	Very Highly Acceptable
Design	4.11	Highly Acceptable
Functionality	4.19	Highly Acceptable

Conclusions

Based on the findings of the study discussed above, the following conclusions were determined:

1. The level of acceptability of "Laborapparatus: A Student Guide Website About Laboratory Apparatus" in terms of content, design, and functionality to IT experts is "Very Highly Acceptable". The content of the website has a large contribution to this result. It is because the website holds a ton of information about chosen laboratory apparatus from three different laboratories, namely: Biology laboratory, Chemistry laboratory, and Physics laboratory. Moreover, the respondents have given a rating of "very highly acceptable" to the website, because aside from written information, the website also contains photos of the laboratory apparatus from a variety of angles personally taken by the researchers, videos on proper handling, and quiz section to make sure the users have acquired knowledge the website aims to give them. Therefore, the website is effective and accepted by the IT experts and is approved to be used by users. This may lead to recommendation of the website by IT experts to possible users for utilization.
2. The level of acceptability of "Laborapparatus: A Student Guide Website About Laboratory Apparatus" in terms of content, design, and functionality to students is "Very Highly Acceptable". Based on the rating of the students, each criterion reached the very highly acceptable bracket. The respondents have given the website this rating because they were able to access the website, gain knowledge about laboratory apparatus from the website, and had fun answering the quiz on the website. Therefore, the laboratory apparatus guide website made by the researchers serves its purpose to the students by providing them knowledge regarding laboratory apparatus and can be used for academic purposes. This may lead to students utilizing the website for educational purposes, especially in subject areas under sciences and require laboratory use. The students may also recommend the website to their schoolmates and have them use it too whenever they need help about laboratory apparatus.
3. The level of acceptability of "Laborapparatus: A Student Guide Website About Laboratory Apparatus" in terms of content, design, and functionality to Science Teachers is "Very Highly Acceptable". The selected Science teachers rated it to be very highly acceptable because they were able to successfully access the website and are satisfied of the contents present on the website. Therefore, the laboratory apparatus guide website made by the researchers is considered by the Science teachers to be effective and acceptable for them and their fellow teachers to use in discussions about laboratories and laboratory apparatuses. The respondents may have also considered the website as useful for students. This may lead to incorporation of the website or it may be used as a source material for Science teachers in terms of laboratory discussions.

Recommendations

Based on the findings and conclusion presented, the following recommendations are suggested:

1. To the students, it is recommended for them to use this website as a reference and to help them be familiar with the different types of laboratory apparatus as well as their uses. This website is easy to understand and it shows the commonly used laboratory apparatus.
2. To the science and research teachers as well as the laboratory in-charge, it is recommended that they consider this website as a tool that will help them in teaching their students regarding the familiarity and utilization of laboratory apparatus. This website is time friendly and the students can access this anywhere and anytime as long as there is an internet connection.
3. To the school, it is recommended that they promote this kind of teaching tool as it allows an efficient learning which will benefit both the teachers and the learners. This website is free for anyone who likes to learn.
4. To the future researchers, it is highly recommended that they consider this study as a reference in conducting future research and apply some of the recommendations that was suggested in this study in order for them to improve their research study.

To the future researchers who will conduct similar studies in the future, it is recommended to add more information on how to properly use or manipulate the different laboratory apparatus in the website. It can be done through a video presentation which may be performed personally by the researchers or grabbed from the internet.

Additionally, the websites user interface is better in personal computers than in mobile phones. It is recommended for the website to display the same user interface such as adjusting some of the spacings and alignments so that it will appear nicely both in computers and mobile phones.

Moreover, it is also recommended to make its display appropriate such as making the picture appear simple but noticeable. An F-shaped layout was also suggested in arranging the information presented in the website.

References

1. Aljuhani, K., Sonbul, M., Althabiti, M., & Meccawy, M. (2018). *Creating a Virtual Science Lab (VSL): the adoption of virtual labs in Saudi schools. Smart Learning Environment*, 5 (16). Retrieved from: https://slejournal.springeropen.com/articles/10.1186/s40561-018-0067-9; Retrieved on: June 29, 2021
2. Alneyadi, S. S. (2019). Virtual lab implementation in science literacy: Emirati science teachers' perspectives. EURASIA Journal of Mathematics, Science and Technology Education, 15(12). Retrieved from: https://doi.org/10.29333/ejmste/109285; Retrieved on: April 4, 2021.
3. Dyrberg, N. R., Treusch, A. H., & Wiegand, C. (2016). Virtual laboratories in science education: Students' motivation and experiences in two tertiary biology courses. Journal of Biological Education, 51(4), 358-374. Retrieved from: https://doi.org/10.1080/00219266.2016.1257498; Retrieved on: April 14, 2021.
4. Flowers, L. O. (2011, December). Investigating the Effectiveness of Virtual Laboratories in an Undergraduate Biology Course. The Journal of Human Resource and Adult Learning. Retrieved from: https://www.hraljournal.com/Page/12%20Lawrence%20O.%20Flowers- 1.pdf; Retrieved on: April 11, 2021.
5. Glen, S. (2015). Purposive Sampling. Retrieved from: https://www.statisticshowto.com/purposive-sampling/; Retrieved on: April 4, 2021.
6. Luenendonk, M. (2019). Research and Development (R&D) Overview and Process. *Cleverism*. Retrieved from: https://www.cleverism.com/rd-research-and-development-overview-process/; Retrieved on: April 8, 2020.
7. Hirschfeld, G., & Thielsch, M. (2019). Facets of Website Content, Human–Computer Interaction, 34:4, 279-327, DOI: 10.1080/07370024.2017.1421954. Retrieved from: https://www.tandfonline.com/doi/abs/10.1080/07370024.2017. 1421954; Retrieved on: June 28, 2021.
8. Oser, R. (2013). Effectiveness of Virtual Laboratories in Terms of Achievement, Attitudes, and Learning Environment among High School Science Students [Doctoral dissertation]. Retrieved from: https://core.ac.uk/download/pdf/195631589.pdf; Retrieved on: April 10, 2021.
9. Potkonjak, V., Gardner, M., Callaghan, V., Callaghan, P., Guetl, C., Petrović, V. M., & Jovanovića, K. (2016, February 11). Virtual laboratories for education in science, technology, and engineering: A review. ScienceDirect.com | Science, health and medical journals, full text articles and books.Retrieved from: https://www.sciencedirect.com/science/article/abs/pii/S0360131516300227; Retrieved on: April 14, 2021.
10. Sabales, M. (2018). The Effects of Using Virtual Laboratory Materials on Students' Academic Performance in Physics. *ResearchGate*. Retrieved from: https://www.researchgate.net/publication/334760212_The_Effects_of_Using_Virtual_Laboratory_Materials_on_Students'_Academic_Performance_in_Physics; Retrieved on June 28, 2021.
11. Watson, C. (2017, April 25). Why are safety goggles important? Sciencing. Retrieved from: https://sciencing.com/why-safety-goggles-important-4579751.html; Retrieved on: April 9, 2021.

