

Development of Interactive Website using Google Sites as a Supplemental Tool in teaching Industrial Arts 8

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Abstract

The lack of adequate supplementary materials in TLE: Industrial Arts – Electrical Services hinder student's chance for engaging and significant learning. This study focuses on developing and evaluating interactive websites using Google Sites as a supplemental tool to enhance Grade 8 students' proficiency of the selected competencies. Developmental research design was used, involving ten (10) expert validators and forty (40) Grade 8 students from Sta. Filomena Integrated School. The study started with the administration of an assessment in identifying least mastered competencies, followed by the development and expert validation of the interactive website. After the implementation of the interactive website developed in the class, a post-test and evaluation were given to assess its effectiveness. The results show that there is a significant difference between the pretest and posttest scores of the students in IA: Electrical Services after using the interactive website on Google Sites. It indicates that the website is effective in improving students' learning performance. Therefore, the null hypothesis, saying that there is no significant difference between the pretest and posttest scores, was rejected. On the other hand, there was no significant relationship between the learners' evaluation of the interactive website and their posttest scores. It implies that the students' perceptions of the website did not significantly influence their academic learning performance; thus, the null hypothesis saying that there is no significant relationship between the learners' evaluation and their posttest scores was accepted. In conclusion, the results revealed that integrating interactive websites as supplemental materials can enhance engagement and reinforce learning outcomes in IA: Electrical Services.

Keywords: Supplementary Materials, Industrial Arts, Electrical Services, Interactive Website

1. Introduction

Technology and Livelihood Education respond to the needs of the community and provide learners with the knowledge and skills needed for vocational skills and technological ability in daily life. This curriculum develops students' knowledge, skills, values and attitudes for career readiness. The implemented curriculum of Department of Education aims the holistic development of every Filipino learner with 21st century skills who is sufficient to work, entrepreneurship, skills development and in higher education. The K-12 program also established that TLE plays a very important role in the success of overall goal of the curriculum.

On the other hand, the newly implemented curriculum, the Revised K-12 MATATAG Curriculum, aims to improve the country's basic education system. By making it more responsive, inclusive and effective. This curriculum strengthens TLE in developing lifelong learning skills, preparedness for work, and contributes to the national development. Calanog (2023) reveals that TLE curriculum in Grades 7-8 are exploratory in nature. It focuses only on five basic common competencies. It includes the proper use of tools and equipment, maintenance of tools, proper mensuration and calculation, interpretation of layouts and drawing plants, and most

importantly, practice of occupational safety and health procedures.

In developing 21st century skills, under the Revised K-12 MATATAG Curriculum, TLE 7 and 8 follows four quarterly components: Quarter 1 offers Information and Communication Technology (ICT), which focuses on basic productivity tools, graphic designing, and video editing. Quarter 2 explores Agriculture and Fishery Arts (AFA) including farm and basic crop production. Quarter 3 offers Family and Consumer Sciences (FCS), focuses on familiarizing with kitchen tools, food services, basic clothing and beauty care. In Quarter 4, IA offers which focuses on basic construction, electrical/electronic services, and small engine services.

IA, as part of the Revised K-12 MATATAG Curriculum in TLE focuses on hands-on learning in areas like basic construction like woodworking and metalworking, basic electrical/electronic services, and basic small engine services. It reinforces students to develop practical and technical skills, and work ethics for daily life and their future careers. It uplifts tools proficiency, creativity, safety and values.

The effectiveness of teaching and learning process depends on instructional materials to be used. When learners have easy access to these materials, learning enhances. Thus, Mayos (2023) implies that a lack of materials like books and modules can lower academic outcomes. It highly suggests the importance of developing instructional material. To define, Instructional materials serve as a guide to teaching and learning process, tailoring objectives and methods (Right, 2028). Whether traditional or modern, these tools help students understand the lessons better and support improving learning outcomes. Meanwhile, teachers play a key role in developing instructional materials that meet the students' needs. One of the learning materials widely used in schools is textbooks. However, many textbooks are outdated and merely focus on memorization rather than understanding. It makes it less effective in supporting learning (Ansary, 204).

A study of Alsong (2023) implies that TLE teachers are satisfied with their teaching, but students are less engaged when using modular or written materials. Students are performing better in hands-on learning rather than in written tasks. It is also stated that students were engaged in TLE subject matter, but they lacked motivation due to limited hands-on activities. It indicates that textbooks alone may not be enough to keep students engaged (Cabansag & Curan 2023). Well-designed instructional materials aid teachers in addressing diverse learning needs. It improves engagement and supports competency-based instructions. It also fills gaps in teachers' practices and access to the materials. It also suggested that supplementary resources are vital for effective TLE curriculum delivery. (Villareal & Habla 2023).

Meanwhile, supplemental materials are essential for effective teaching and learning. It can enhance student's understanding by giving another resource beyond textbooks (Kilundo, 2022). These materials create more engaging and personalized learning environment. That is why parents and educators increasingly utilize in supporting student's learning outcomes (Adams, 2020). The students are actively engaging with interactive learning materials. It helps them in building independent learning. Stanford University School of Medicine stated that using interactive and practical materials allow teachers to better evaluate and support the learners. It includes text, images, audio, video, and simulation activities. Unlike traditional printed materials and PPT, it often limits students to read and view lesson content. Interactive websites provide features like embedded quizzes, instant feedback, and other multimedia simulations.

Interactive website tools not only demote content overload, but also promote engagement and retention compared to traditional materials. It serves as more responsive and learner centered. These tools also go over passive learning and assist learners better understand the lessons and remember concepts. Learners are engaged using interactive websites, they're more active, have an ability to retain information and perform better academically (Fuentes, 2023). To support this, a study of Butawan (2021) stated that interactive websites used as teaching methodologies are significantly more effective in helping students better understand the lessons. These tools promote active learning and allow teachers to modernize their teaching instructional methods.

1.1 Background of the Study

Sta. Filomena Integrated School is a public school that offers TLE curriculum, a subject matter that focuses on developing students' practical skills in areas like cookery, agriculture, industrials arts, and entrepreneurship. These skills mentioned require both classroom instruction and practical skills to ensure effective learning.

However, the school lacks sufficient supplemental materials. This absence makes it difficult for teachers to deliver lessons efficiently. It hinders also the students from acquiring skills needed for real-life applications. Supplemental materials in TLE help students understand concepts and improve skills performance. If they lack these resources, students may encounter difficulty with understanding the lesson and they will be less prepared for future jobs. (Dela Cruz, 2021)

Supporting this, a study of Colendra & Carada (2024) implies the effectiveness of interactive web tools like Word Wall and Class Point. These tools enhance the reading comprehension of Grades 7 students. It supports also that interactive websites are sufficient supplemental tools in various subjects like TLE in developing higher order thinking skills and self-directed learning.

Additionally, Lauzon (2024) also highlighted interactive instructional approaches, including guided practice and demonstration through digital platforms contributes to active learners' engagement. Findings aligned with the goals of the K-12 curriculum that aims for a learner-centered and technology enhanced education. One of the interactive instructional platforms that can be used is Google Sites. It is a simple and free platform that works well in educational settings. It is used for creating class portfolios, project pages and collaboration of the students. This tool is easy to integrate with Google Workspace like Google Docs, Slides and Google Drive. It is vital for teachers and learners with limited technical and digital skills. Compared to other platforms, it offers minimal customization options. It also provides advanced features like interactive content, multimedia integration, instant feedback and other learning management tools that are needed in the learning process.

With this, Google Sites enhances student engagement and supports teaching strategies. Bueno et. Al (2022) mentioned also that platforms like Google Sites support the integration of various multimedia elements that include text, images, videos and interactive components. It can enhance the learning experiences and cater diverse learning. It also facilitates by allowing learners to work together on a project, share various resources and provide real time feedback. In this study, the researcher used Google Sites platform in developing interactive websites as a supplemental tool in teaching Industrial Arts 8: Electrical Services.

Methodology

This section presents the research design of the study, including the respondents, population, sampling technique, data gathering procedures, instrument formulation, and the establishment of the validity and reliability status of the instrument used to provide answers to the statement of the problem.

1.2 Research Design

This study used a Developmental Research Design. This research design is suitable for creating and testing educational tools. It follows the R&D Model (Research and Development), a systematic process used to develop new products, services or methods and even to improve existing ones. This study conducted in four (4) phases: Planning and Analysis, Development, Validation Phase and Evaluation Phase.

1.3 Respondents of the Study

The study involves ten (10) expert-validators selected consisting of: Content Experts (3), Instructional Designers or Learning Resources Coordinators (3), Technical Experts or ICT Coordinator (2), and DepEd Curriculum Specialists (2). Additionally, the respondent of this study is forty (40) Grade 8 students in an intact class from Sta. Filomena Integrated School.

1.4 Population and Sampling Technique

In this study, the researcher employed a purposive sampling technique in selecting the participants and respondents of the study therefore an intact class of Grade 8 students (n=40) and expert validators (n=10) were chosen. In line with this, sampling method mentioned was chosen by the researcher due to practical consideration, approval from the administration, and resource constraint. Meanwhile, expert validators were identified through recommendations from the Division of San Pablo and professional networks in Education. www.ijrp.org

Technology.

1.5 Data Gathering Procedures

The study begins with securing permission from the Department of Education Division Office and the School Principal, followed by obtaining consent from students. Next, a 40-item assessment was administered to Grade 8 learners to determine the baseline competencies in Industrial Arts and results were analyzed to identify least mastered competencies. Based on these results, an interactive website developed using Google Sites designed according to Gagné's Nine Events of Instruction. It is enriched with videos, interactive diagrams, worksheets, and practice quizzes. The interactive website was validated by experts for content, instructional, technical quality and other findings. Afterwards, the revisions were made based on their feedback.

During implementation, a forty (40) item pretest in IA: Electrical Services was employed. Afterwards, the students were oriented on how to use the website which was integrated into classroom setting. Next, a forty (40) item post-test was conducted to measure learning gains. Next, a learner's evaluation survey was distributed to gather feedback on usability, engagement, and helpfulness in their learning. And lastly, all data was encoded, analyzed statistically and interpreted to prepare the final report and recommendations.

1.6 Research Instrument

In gathering the necessary data for this study, three (3) instruments were utilized: a Validation Tool for Expert Validators to evaluate and validate the website, a survey questionnaire for Student-Respondents, and pretest and posttest for Grade 8 students. The assessment administered prior to the use of the interactive website to identify specific TLE: Industrial Arts competencies where students may need additional support. After the students have used the website as a supplemental learning tool, a post-test conducted to determine whether there has been improvement in their understanding and mastery of the targeted competencies. All instruments were validated by internal and external validators and even subject matter experts to ensure their reliability and alignment with the TLE curriculum standards.

1.7 Statistical Treatment of Data

In this study, the data collected from the pretest and posttest scores of Grades 8 students were analyzed using one sample t-test to determine the improvement of the student performance after using the interactive website. The difference between the pretest and posttest scores assess the effectiveness of the website in enhancing learning outcomes. Additionally, the Correlation Coefficient was used to measure relationship between the learners' evaluation and their posttest scores. These statistical methods provide a clear and organized presentation of the results to support the findings of the study.

2. Results and Discussion

This section presents the results of the study including the illustrative table and their corresponding analysis as well as the interpretation derived from the statistical treatment.

Table 1

Pre-Test and Post-Test Scores of the Students Respondents

Scores	Pretest		Posttest		Interpretation
	f	%	f	%	
33-40	0	0.0	14	35.0	Advanced
25-32	18	45.0	26	65.0	Proficient
17-24	22	55.0	0	0.0	Approaching Proficient
9-16	0	0.0	0	0.0	Developing
0-8	0	0.0	0	0.0	Beginning
Total	40	100	40	100	

Legend: 0-8 Beginning, 9-16 Developing, 17-24 Approaching Proficient, 25-32

Proficient, 33-40 Advanced

Table 1 presents the pretest and posttest scores of the students. The results show that during the pretest most of the students comprising 55 percent were classified under the Approaching Proficient Level (scores 17–24), while 45 percent were under the Proficient Level (scores 25–32). No student reached the Advanced Level (scores 33–40), and none fall under the Developing and Beginning levels. It indicates that before using the developed interactive supplemental materials, students demonstrated a moderate level of understanding of the subject matter.

On the other hand, the posttest results show an improvement in students' performance. A majority of 65 percent of the students were classified under the Proficient Level while 35 percent reached the Advanced level. No student remained under the levels of Approaching Proficient, Developing, and Beginning.

The distribution of scores from the pretest to the posttest indicates a significant improvement in students' performance. This implies that the developed interactive websites using Google Sites utilized in the study were effective in enhancing the students' learning outcomes.

Table 2
Level of Satisfaction with the Interactive Website using Google Sites

Indicators	Mean	Interpretation
1. Content Quality	3.98	Very Satisfactory
2. Instructional Quality	3.98	Very Satisfactory
3. Technical Quality	3.97	Very Satisfactory
4. Other Findings	3.95	Very Satisfactory
Over-All	3.97	Very Satisfactory

Legend: 3.50-4.00- Very Satisfactory (VS), 2.50-3.49- Satisfactory (S), 1.50-2.49- Poor (P), 1.00-1.49- Not Satisfactory (NS)

Table 2 shows that the expert-validator respondents' level of satisfaction with the interactive website developed using Google Sites is very satisfactory with an overall mean score of 3.97. This implies that the website effectively met the learners' expectations in terms of content, instructional, technical quality and other findings.

The following indicators, such as Content Quality and Instructional Quality, both obtained the highest mean score of 3.98, interpreted as Very Satisfactory. This implies that the materials presented on the website were accurate, relevant, and well-structured. The instructional strategies utilized in the platform effectively facilitated student understanding. The results significantly imply that learners found the website content and instructional are engaging and aligned with their learning needs.

In terms of Technical Quality, a mean score of 3.97 was obtained and interpreted as Very Satisfactory. This implies that the website was user-friendly, accessible, and functioned smoothly and it allows learners to use and navigate the platform easily. Meanwhile, Other Findings garnered a mean score of 3.95, still within the Very Satisfactory. This clearly shows that the website consistently performed well across all indicators needed in evaluating the interactive website.

The overall mean score of 3.97 signifies a high level of acceptability of the interactive website as a supplemental learning tool. These findings are supported by the study by Mayer, R. (2009) emphasizes in the Cognitive Theory of Multimedia Learning. A well-designed multimedia instructional material can enhance learners understanding and satisfaction by integrating words and visuals effectively. Additionally, Hannafin, J. (2001) implies that interactive website learning environments are engaging, structured and learner-centered significantly improve student engagement and overall satisfaction.

Based on the results, the researchers conclude that the interactive website created using Google Sites is an effective and highly acceptable instructional material. The consistency of "Very Satisfactory" ratings in all indicators shows that the platform successfully delivers quality content, supports effective instruction, and provides a positive user experience. Therefore, it can be inferred that the integration of interactive websites in teaching can enhance learners' satisfaction and engagement.

Table 3
Learners' Evaluation of the Interactive Website using Google Sites

Indicators	Mean	Interpretation
1. Usability	4.42	Strongly Agree
2. Engagement	4.62	Strongly Agree
3. Helpfulness in Learning	4.6	Strongly Agree
Over-All	4.55	Strongly Agree

Legend: 4.50-5.00 Strongly Agree, 3.50-3.49 Agree, 2.50-3.49 Neutral, 1.50-2.49 Disagree, 1.00-1.49 Strongly Disagree

Table 3 shows the learners' evaluation of the interactive website developed using Google Sites in terms of usability, engagement, and helpfulness in learning. The overall mean score of 4.55 interpreted as Strongly Agree indicates that the learners had a highly positive evaluation of the website. This suggests that the interactive website was effective in meeting the learners' needs and expectations as a supplemental tool.

Among the indicators, Engagement obtained the highest mean score of 4.62 interpreted as Strongly Agree. This implies that the learners found the website highly engaged, captured their interest and encouraged active participation in the learning process. The findings highlight the effectiveness of interactive websites using Google Sites sustained learners' attention and motivation.

Similarly, Helpfulness in Learning garnered a mean score of 4.60, also interpreted as Strongly Agree. This implies that learners perceived the website as a valuable resource that supports their understanding of the lesson content in Electrical Services. It suggests that the content and activities embedded on the website contributed significantly to improving their learning experience. On the other hand, Usability obtained a mean score of 4.42, still interpreted as Strongly Agree. Although it signifies slightly lower than the other indicators, this result shows that the learners found the website was easy to navigate, user-friendly, and accessible. The high usability rating strongly confirmed that the design and layout of the website facilitated efficient interaction with the learning materials.

The overall mean of 4.55 implies a consistently high level of agreement among learners regarding the effectiveness of the interactive website across all indicators. These findings are supported by the study of Davis, F.D. (1989), who proposed the Technology Acceptance Model (TAM), emphasizes that perceived usefulness and ease of use significantly influenced users' acceptance of a technological system. The high ratings in usability and helpfulness in learning in the present study affirm this theory, as learners are more likely to accept and positively evaluate the interactive websites that are useful and easy to use.

Moreover, Bransford et al. (2000) highlights that learning environments which promote active engagement enhance students' understanding and retention. Additionally, Mayer, R. (2009) emphasizes that interactive multimedia resources improve learning outcomes. By fostering meaningful interaction with content, which aligns with the learners' strong agreement on the helpfulness of the website.

Based on the results, the researchers therefore conclude that the interactive website developed using Google Sites is a highly effective instructional tool that promotes usability, engagement, and is helpful in learning. The learners' strong agreement across all indicators demonstrates that the interactive website successfully integrates website elements of effective digital learning environments. Thus, the use of interactive websites is recommended as a supplementary tool to enhance student engagement and improve learning outcomes.

Table 4
Significant difference between the pre-test and post-test scores of students

Interactive Website	MEAN	SD	t	df	Sig. (2-tailed)	Remarks
Pre-Test	24.30	3.18	-13.898	39	.000	Significant
Post-Test	30.55	3.60				

** p = .000 (< 0.05), indicating a significant difference

Table 4 presents the comparison of students' pretest and posttest scores after using the interactive website. The findings imply that the pretest mean score was 24.30 (SD = 3.18) while the posttest mean score increased to 30.55 (SD = 3.60). The T-test analysis yielded a t-value of -13.898 and the p-value of .000 implies a statistically significant level at the 0.05 level.

These findings indicate that students' performance improved significantly after using the interactive website. It significantly shows that the increase in the mean score from pretest to posttest reveals that the website effectively enhanced students' mastery of Electrical Services competencies.

This result suggests that the interactive website served as an effective supplemental teaching material. This material supported active learning, learning practices and application of concepts in Industrial Arts. In conclusion, the utilization of the interactive website using Google Sites platform significantly improved the students' performance in Electrical Services competencies highlighting its effectiveness as a supplementary tool in Industrial Arts instruction.

Table 5

Significant relationship between the level of evaluation of the interactive websites and the post-test scores of the students after its use

LEARNER'S EVALUATION	r-value	Interpretation
Usability	-.015	Not Significant
Engagement	.030	Not Significant
Helpfulness In Learning	.017	Not Significant

**. Correlation is significant at the 0.01 level (2-tailed)

Table 5 results show that the correlation between learners' evaluation of the interactive website and their post-test scores was not significant. The computed r-values were -0.015 for usability, 0.030 for engagement, and 0.017 for helpfulness in learning. These values are very close to zero and it indicates no significant relationship between students' level of evaluation of the website and their posttest scores after its use. Even though students have perceived the interactive website as usable, engaging, and helpful on their learning these perceptions did not significantly predict their academic achievement.

Aligning with these results is the Technology Acceptance Model proposed by Davis (1989) on the perceived usefulness and acceptance of technology. Davis (1989) states that acceptance alone does not necessarily translate into measurable performance gains.

Additionally, learning outcomes are influenced by multiple cognitive factors. In line with this, Mayer, R. (2009) explained in the Cognitive Theory of Multimedia Learning that meaningful learning depends on active cognitive processing and students' prior knowledge as well as their ability to integrate new information. Similarly, self-regulated learning and individual effort play critical roles in academic achievement (Zimmerman, 2002).

Therefore, the absence of a significant relationship indicates that even though the interactive website was evaluated positively, students' subjective perceptions don't predict their learning outcomes. This indicates that academic improvement may have been more strongly influenced by multiple cognitive factors as compared by the perceived website characteristics alone.

3. Conclusion and Recommendations

This section includes the conclusions and recommendations based on the given problems and objectives of this study. Based on the findings, the following conclusions were drawn: 1. There is a significant difference between the pre-test and post-test scores of the students in Industrial Arts – Electrical Services competencies after using the interactive website using Google Sites platform. This implies that the interactive website was effective in improving the students' learning outcomes. Therefore, the null hypothesis saying that there is no significant difference between the pretest and posttest scores is rejected; and 2. There is no significant relationship between the learners' evaluation

of the interactive website using Google Sites and their posttest scores. This implies that the students' evaluation of the website did not significantly influence their academic performance after using the supplemental tool. Therefore, the null hypothesis is accepted.

Meanwhile, based on the findings and conclusions of this study, the following recommendations are proposed: 1. For Teachers: Teachers may integrate interactive websites using Google Sites, as supplemental tools to enhance students' competencies and learning gains, they may encourage students to actively engage with interactive content, since improvement in learning outcomes is influenced more by active participation and prior knowledge as compared by perceptions of usability alone and may apply instructional strategies grounded the theories used by the researcher to structure lessons that promote meaningful learning; 2. For Students: Students may actively utilize interactive websites using Google Sites to reinforce prior knowledge, practice skills and support independent learning and may engage thoroughly in all interactive activities to maximize learning gains rather than relying only on the perceived usability and engagement of the material; 3. For Future Researchers: Future researchers may investigate the long-term effects of interactive instructional websites on academic performance across various subjects, may examine which among indicators of the interactive websites strongly influence student learning outcome and may explore strategies to strengthen the relationship between learners' evaluation and student learning outcomes to enhance instructional effectiveness; and lastly, 4. For Instructional Designers/Developers: Ensure that the interactive websites are accurate, error free and aligned with DepEd standards to maintain high instructional quality and may collect and incorporates student feedback to improve the interactive websites and promotes meaningful independent learning.

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