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Web-Based Intelligent Tutoring System On Students Achievement And Interest In Technical Drawing In Niger State

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ABSTRACT

The study examines how a web-based innovative coaching system affects students' performance and interest in technical drawing in Niger, Nigeria. The hypotheses created in answer to the two study questions are evaluated using the A.05 significance threshold. The investigation was conducted utilizing a pre-post non-equivalent control group quasi-experimental study design. The study's participants comprised 428 National Technical College (NTC) II, students. The sample size for this study was 180 students, of whom 68 were in the experimental group, and 112 were in the control group. The experimental group employed Simple Random Sampling (SRS) and intentional sampling techniques. The instruments used to gather data are the Technical Drawing Achievement Test (TDAT) and the Technical Drawing Interest Inventory (TDII). The reliability coefficient for TDAT is 0.77, whereas the reliability coefficient for TDII is 0.79 using the Pearson Product Moment Correlation coefficient. The mean was used to answer research questions, and ANCOVA was used to evaluate the hypotheses. The study's findings demonstrated that web-based intelligent tutoring solutions are more successful in raising student achievement and piquing their interest in technical drawing than traditional teaching techniques. It was suggested that professors, particularly those teaching technical drawing, employ a web-based intelligent tutoring system for technical college students to enhance students' academic performance and pique their interest in technical drawing.

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1. INTRODUCTION

In technical institutions in Nigeria, technical drawing is a required trade-related topic for engineering and construction trades students. The case is a language used by engineers, technicians, artisans, and businesspeople to communicate. They defined technical drawing as a global language that all engineers and technicians may understand. Because it is a graphical language, the lines are mainly used to express the meaning. It is impossible to overstate the value of technical drawings since they enable effective communication between engineers and potential engineers[1]–[4]. This communication can then be used to document the planning process. According to reports, technical college students consistently show low achievement in technical drawing. Low technical drawing achievement was ascribed to the need for cutting-edge learning strategies, including web-based intelligent tutoring systems.[5]–[9]

A web-based intelligent tutoring system can be characterized as a learner-centered learning system that encourages interaction between students and between students and the teacher, as well as a self-directed learning environment [10]. A web-based intelligent tutoring system is an excellent learning tool personalized to each learner's needs and preferences, claim The core

elements of a web-based intelligent tutoring system, comprise, among other things, the relevant tools, technology, media, textbooks, teachers, and students. These essential elements should be organized using constructivist learning theory, mixed learning theory, and modern teaching theory[11]–[13]. Claimed that Web-based intelligent tutoring systems enhance communication, reasoning, and problem-solving abilities by using new e-learning technology with smart gadgets. Instead of being content- and technology-driven, it enables the development and deployment of a learning environment that is knowledge- and learner-driven and improves students' academic achievement.

Therefore, academic success is defined as a student's performance in a subject as indicated by a test score. Academic achievement refers to a few ways of communicating a student's academic achievements[14]–[16]. This can be viewed as a program of study's average for selecting subjects, courses, or grade. Achievement is based on some variables, including teaching methods, the learning environment, motivation, and interest, According to [17] also reaffirmed the link between student interest and academic success.

Unfortunately, despite the government's efforts to guarantee high-quality instruction at the technical college level, complaints of low academic accomplishment in a technical drawing among students of technical colleges have persisted. The traditional teaching approaches, such as lectures and group discussions, were blamed for the student's poor academic performance in technical drawing. Interactive teaching techniques are one of the tried-and-true approaches to prevent children from performing poorly in school and to increase their enthusiasm for learning [18], [19]. In order to determine how an intelligent tutoring system based on the Web influenced student achievement and interest in technical drawing in Niger State, Nigeria.

2. RESEARCH METHOD

The study used a pre-post non-equivalent control group design, which is a quasi-experimental method. The study was carried out in Nigeria's Niger State. 428 National Technical Certificate (NTC) II students enrolled in the Technical drawing program during the 2017/2018 academic year in Niger State, Nigeria, made up the study's population. 180 NTC II students were chosen as the study's sample size. Using deliberate sampling, Government Technical College in Minnesota was randomly allocated to the experimental group.

In contrast, Mamman Kontagora Technical College (MKTC), Pandogari, was chosen and assigned to the control group using the Simple Random Sampling (SRS) technique. Technical Drawing Achievements Test (TDAT) and Technical Drawing Interest Inventory were the two tools used to collect data (TDII). Three experts, including two professors ‘from the National Examination Council's Examination Development Department and one team member from the Federal University of Technology's Department of Industrial and Technology Education in Minna, Nigeria (Technical Drawing Unit), subjected the instruments to face and content validation (NECO).[9], [20], [21]

A trial exam was carried out on NTC III students at Mada Station Government Technical College, Nasarawa State, Nigeria to verify validity of TDAT and TDII. Dependability coefficient of TDAT was calculated using Pearson Product Moment Correlation (PPMC) and was found to be 0.77. Using Cronbach's Alpha, the dependability coefficient value for the TDII was estimated to be 0.79. Before the experimental and control groups received their treatments in the first week of the research exercise, All pupils received the pre-test. Students in the test group underwent a pre-test after that. received instruction utilizing an online intelligent tutoring system.[22]–[24]

In contrast, students in the control group received instruction using a more traditional teaching strategy. Their average teachers taught both groups. The statistical software SPSS version 23.0 was used to analyze the data gathered for this investigation. To examine the data, descriptive and inferential statistics were employed. The Analysis of was carried out using the General Linear Model (univariate) function (ANCOVA). Regardless of how closely the other groups' means were spaced, the groups with higher standards were assumed to have scored better on accomplishment tests or shown much interest in technical drawing. When F is significant, it is implied that the null hypothesis should be accepted and when F is substantial, it is suggested that the null hypothesis should be rejected.

3. RESULTS AND DISCUSSION

At this stage, the results of the interview were carried out by giving several questions to the correspondence.

Result:
Research Question 1
What is the impact of Web-based intelligent tutoring system on students’ achievement in Technical drawing?

“Mean of Pre-test and Post-test Scores of Students Taught Technical Drawing Using Web-based intelligent tutoring system and Those Taught with Conventional Teaching Method in the Achievement Test”

Table 1 Result Questioner 1

Group	N	Pre-test Mean	Post-test Mean	Mean Gain
Experimental	68	10.93	42.17	31.24
Control	112	11.00	30.27	19.27

The experimental group's pre-test to post-test mean gain was 31.24, with a mean pre-test score of 10.93 and a mean post-test score of 42.17. The control group's pre-test mean was 11.0, whereas the post-test mean was 30.27, representing a mean increase of 19.27 between the two tests.

Research Question 2
What is the impact of Web-based intelligent tutoring system on student's interest in Technical drawing?

"Mean of Pre-test and Post-test Scores of Students Taught Technical Drawing Using Web-based intelligent tutoring system and Those Taught with Conventional Teaching Method in Interest Inventory Test"

Table 2 Result Questioner 2

Group	N	Pre-test Mean	Post-test Mean	Mean Gain
Experimental	68	98.85	129.56	30.71
Control	112	98.92	106.03	7.11

Table 2 shows that the experimental group gained 30.71 between the pre-and post-tests, with a mean interest score of 98.85 on the pre-test and 129.56 on the post-test. The control group's pre-test interest mean score was 98.92, while its post-test interest means the score was 106.03, representing an increase of 7.11 between the two tests.

Hypothesis One

H_{O1}: There are no appreciable differences in the mean achievement scores of students taught technical drawing using a web-based intelligent tutoring system and those who were taught using a traditional teaching method.

"Summary of Analysis of Covariance (ANCOVA) for Test of Significant Difference between the Achievements Mean Scores of Students Taught Technical Drawing Using Web-based intelligent tutoring system and Those Taught with Conventional Teaching Method[25], [26]"

Table 3 Result Hypothesis One

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3918.69[a]	2	1959.35	27.20	.00
Intercept	4640.42	1	4640.42	64.41	.00
Pretest	43.33	1	43.33	.60	.44
Group	3763.40	1	3763.40	52.24	.00*
Error	12751.86	177	72.04		
Total	223325.00	180			
Corrected Total	16670.55	179			

a. R Squared = .235 (Adjusted R Squared = .226)
*Significant (F less than .05)
Table 3 compares students taught technical drawing using a web-based intelligent tutoring system to those taught using a traditional teaching technique and displays the F-calculated value for the effect of instructions on cognitive achievement. 52.24 is the computed value of F for the groups, and F's significance level is.00, which is less than.05. The findings showed a statistically significant difference between students taught technical drawing using a web-based intelligent tutoring system and those prepared using traditional teaching methods in their accomplishment mean scores.

Hypothesis Two
H_{O2}: Students taught Technical drawing using a Web-based intelligent tutoring system, and those taught using the traditional teaching technique in terms of their mean interest scores.

'Analysis of Covariance (ANCOVA) Summary for the Test of Significant Difference in Interests Mean Scores between Students Taught Technical Drawing Using a Web-Based Intelligent Tutoring System and Those Taught Using a Conventional Teaching Method [27], [28] '

Table 4 Result Hypothesis Two

Source	Type III Sum of Squares	*df*	Mean Square	F	Sig.
Corrected Model	7735.12[a]	2	3867.56	849.51	.00
Intercept	161.47	1	161.47	35.47	.00
Pretest	14.92	1	14.92	3.28	.07
Group	7734.73	1	7734.73	1698.93	.00*
Error	805.83	177	4.55		
Total	2651913.00	180			
Corrected Total	8540.95	179			

a. R Squared = .906 (Adjusted R Squared = .905)
*Significance (F less than .05)

Table 4 Shows, The F-calculated value for the influence of instructions on interest, is shown in Table 4, along with a comparison of students taught technical drawing using a web-based intelligent tutoring system versus those taught using a traditional teaching method. The calculated F value for the groups is 1698.93, and the level of significance for F is.00, which is less than.05. According to the results, there is a statistically significant difference in interest mean scores between students who are taught technical drawing using a web-based intelligent tutoring system and those who are taught using a traditional teaching method.

Finding Studies

Students taught utilizing Web-based intelligent tutoring technologies outperformed traditional teaching approaches regarding achievement mean scores. Students who were taught Technical drawing using a web-based intelligent tutoring system scored higher on interest measures than those taught using the traditional teaching technique. In terms of mean achievement scores, there is a significant difference between students taught technical drawing utilizing a web-based intelligent tutoring system and those taught using the traditional teaching technique. The mean interest scores of pupils taught technical drawing utilizing a web-based intelligent tutoring system to differ significantly from those prepared using the traditional teaching technique.

Discussion of Findings

The Technical drawing achievement exam findings on student achievement mean scores showed that students taught using Web-based intelligent tutoring systems had more extraordinary achievement mean scores than students led using traditional teaching methods. The findings are congruent with the findings of Beck, who discovered that a Web-based intelligent tutoring system promotes learning by assisting students' cognitive processing and improving precise mental representations in a variety of ways. ultimately leading to an improvement in students' academic performance. Furthermore, provided a related perspective on the finding that developing students' problem-solving abilities helped them better understand the material they studied through web-based intelligent tutoring systems.

According to the summary of the Analysis of Covariance's (ANCOVA) test of significant difference, there was a statistically significant difference between the achievement mean scores of students taught technical drawing using a web-based intelligent tutoring system and those taught using traditional teaching methods. The findings support those of who discovered a significant difference in the achievement mean scores of students in the experimental and control groups.

Students who were taught utilizing a web-based intelligent tutoring system had higher mean interest scores in technical drawing scored higher on the achievement exam for technical drawing than those taught using a traditional teaching technique. The results supported who found that students with weak literacy abilities might be more interested in environments with Web-based intelligent teaching systems.

4. CONCLUSION

The results demonstrated that a web-based intelligent tutoring system encouraged and boosted student engagement and cognitive achievement. As a result, the technology underlying Web-based intelligent tutoring systems can improve learning. A web-based innovative coaching system is excellent as a teaching aid for technical drawing. As a result, a web-based intelligent teaching system improves students' academic achievement and technical drawing enthusiasm. As a result of this research, According to the National Board for Technical Education, a curriculum development organization, the technical drawing should

be taught via a Web-based intelligent tutoring system. Teachers, particularly those who teach technical drawing, should use web-based intelligent tutoring tools to increase student interest and improve students' cognitive abilities in technical drawing.

REFERENCES

[1] A. Ralf, "A Tutorial of How to Ensure High Automotive Microcontroller Quality," in *Proceedings of the European Test Workshop*, 2021, vol. 2021-May. doi: 10.1109/ETS50041.2021.9465379.

[2] Z. Tsiviltidou and G. Vavoula, "Digital Storytelling as a Framework for Inquiry-Based Museum Learning," 2017. doi: 10.1109/ICALT.2017.50.

[3] X. Ma, Y. Li, R. Liu, Y. Zhang, L. Ma, and Z. Gao, "Frequent itemsets mining of SCADA data based on FP-growth algorithm," 2020. doi: 10.1109/EI250167.2020.9346885.

[4] W. Yun, Z. Lu, K. Feng, X. Jiang, P. Wang, and L. Li, "Two Efficient AK-Based Global Reliability Sensitivity Methods by Elaborative Combination of Bayes' Theorem and the Law of Total Expectation in the Successive Intervals without Overlapping," *IEEE Trans. Reliab.*, vol. 69, no. 1, 2020, doi: 10.1109/TR.2019.2895866.

[5] J. Ming, Z. Jianqiu, M. Bilal, U. Akram, and M. Fan, "How social presence influences impulse buying behavior in live streaming commerce? The role of S-O-R theory," *Int. J. Web Inf. Syst.*, vol. 17, no. 4, 2021, doi: 10.1108/IJWIS-02-2021-0012.

[6] J. Kim, M. Lorenz, S. Knopp, and P. Klimant, "Industrial Augmented Reality: Concepts and User Interface Designs for Augmented Reality Maintenance Worker Support Systems," 2020. doi: 10.1109/ISMAR-Adjunct51615.2020.00032.

[7] A. B. Araojo, "Workshop-drawing equirectangular perspectives for VR panoramas with Eq A sketch 360," 2021. doi: 10.23919/iLRN52045.2021.9459397.

[8] X. Chen and D. Wang, "Project for 'part drawing' teaching," 2018. doi: 10.1109/ICMCCE.2018.00142.

[9] W. Shen, Z. Lin, and H. Wang, "The application of ranking task in mechanical engineering drawing teaching strategy," 2020. doi: 10.1109/LWMOOCS50143.2020.9234314.

[10] A. Ikhwan, A. B. Nasution, and M. Badri, "Active Presenter : Making Videos as Learning Media," vol. 1, no. April, pp. 1–7, 2022.

[11] M. Mukhtar and M. Munawir, "Aplikasi Decision Support System (DSS) dengan Metode Fuzzy Multiple Attribute Decission Making (FMADM) Studi Kasus : AMIK Indonesia Dan STMIK Indonesia," *J. JTIK (Jurnal Teknol. Inf. dan Komunikasi)*, vol. 2, no. 1, p. 57, Oct. 2018, doi: 10.35870/jtik.v2i1.54.

[12] H. Wu and Y. Qi, "Application of Computer Software Processing Technology in Performance Information Management System," 2021. doi: 10.1109/IWCMC51323.2021.9498597.

[13] M. Naomi, H. Noprisson, F. I. Komputer, U. Mercu, and B. Jakarta, "Analisa Dan Perancangan Sistem Pengaduan Mahasiswa Berbasis Web (Studi Kasus : Universitas Mercu Buana Kranggan) Pendahuluan Landasan Teori," *JUSIBI (Jurnal Sist. Inf. Dan E-Bisnis*, vol. 1, no. 5, pp. 185–193, 2019.

[14] L. Picinali, "3D Tune-In: 3D-Games for Tuning and Learning About Hearing Aids," 2018. doi: 10.1109/vr.2018.8446298.

[15] S. Fuada, "Incident management of information technology in the indonesia higher education based on COBIT framework: A review," *EAI Endorsed Trans. Energy Web*, vol. 19, no. 22, 2019, doi: 10.4108/eai.13-7-2018.156387.

[16] T. N. Utami, R. Sayekti, and T. Santi, "The Impact of Light Intensity on the Subjective Complaints of Librarians and Users: an Investigation of an Academic Library," *Libr. Philos. Pract.*, vol. 2021, 2021.

[17] I. K. Raharjana, I. Ibadillah, Purbandini, and E. Hariyanti, "Incident and service request management for academic information system based on COBIT," in *International Conference on Electrical Engineering, Computer Science and Informatics (EECSI)*, 2018, vol. 2018-October. doi: 10.1109/EECSI.2018.8752792.

[18] T. Yue, Y. Li, and Z. Hu, "Dwsa: An intelligent document structural analysis model for information extraction and data mining," *Electron.*, vol. 10, no. 19, 2021, doi: 10.3390/electronics10192443.

[19] A. Agnes Lydia and F. Sagayaraj Francis, "Convolutional neural network with an optimized backpropagation technique," 2019. doi: 10.1109/ICSCAN.2019.8878719.

[20] A. Z. Sampaio, "Historical evolution of technical drawing in engineering," 2018. doi: 10.1109/CISPEE.2018.8593496.

[21] R. T. T. Putro, "Drawing as a basic ability of design students in thinking visual and understanding of form logic," 2019. doi: 10.1109/ECTI-CON47248.2019.8955203.

[22] M. Hamdani, M. Taki, M. Rahnama, A. Rohani, and M. Rahmati-Joneidabad, "Prediction the inside variables of even-span glass greenhouse with special structure by artificial neural network (MLP-RBF) models," *J. Agric. Mach.*, vol. 10, no. 2, 2020.

[23] M. Badri, A. Ikhwan, and R. A. Putri, "IMPLEMENTASI AUGMENTED REALITY PADA MEDIA PENGENALAN," vol. 7, no. 2, pp. 109–121, 2022.

[24] A. Setiawan, Soeheri, E. Panggabean, M. A. Elhias, F. Ikorasaki, and B. Riski, "Efficiency of Bayes Theorem in Detecting Early Symptoms of Avian Diseases," 2019. doi: 10.1109/CITSM.2018.8674273.

[25] T. Williams and R. C. Leishman, "Validation of Doppler Lidar Sensor using Covariance Analysis," in *Proceedings of the IEEE National Aerospace Electronics Conference, NAECON*, 2021, vol. 2021-August. doi: 10.1109/NAECON49338.2021.9696418.

[26] Q. Li, Y. Fan, H. Xu, X. Liang, and J. Yan, "A New Approach for Nonlinear Transformation of Means and Covariances in

Direct Statistical Analysis of Nonlinear Systems," *IEEE Access*, vol. 9, 2021, doi: 10.1109/ACCESS.2021.3083185.

[27] H. Sawada, R. Ikeshita, and T. Nakatani, "Experimental analysis of em and mu algorithms for optimizing full-rank spatial covariance model," in *European Signal Processing Conference*, 2021, vol. 2021-January. doi: 10.23919/Eusipco47968.2020.9287336.

[28] C. H. Kang, S. Y. Kim, and J. W. Song, "Data Fusion with Inverse Covariance Intersection for Prior Covariance Estimation of the Particle Flow Filter," *IEEE Access*, vol. 8, 2020, doi: 10.1109/ACCESS.2020.3041928.