The Development of Artificial Learning Media to Fasilitate Active Learning to Improve Learning Outcome on The Teaching of Gas Chromatography

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Abstract: The aim of this research is to develop artificial learning media to facilitate active learning to improve student learning outcomes in gas chromatography material separation chemistry, determining the suitability of website media as assessed by material expert validators, learning experts, and design experts, as well as describing the effectiveness of this media in improving student learning outcomes on the concept of gas chromatography. This Research and Development uses the ADDIE model (Analysis, Design, Development, Implementation and Evaluation). Test the product conducted in small groups consisting of 27 students from two classes. Expert material, prayer a learning expert, two design experts, and pre-test and post-test results were used collect data, which is then explained and described. Validators stated that website media was suitable for use in the learning process with an average score of: 93.5%, 95.3%, and 97.2% with very feasible criteria and media created by this website has been effective in improving student learning outcomes and can be used in learning process. The average pre-test score is 70.65/150 while the average post-test score is 124.25/150 obtained. with a standard error of 0%, and effectiveness reaching 90% using Shapiro Wilk data processing in SPSS 16.

Introduction

As we know, in today's student environment, there is vigilance and a willingness to accept any curriculum changes that have occurred and have been adopted by decision. The current curriculum is specifically designed for chemistry subjects which require students to achieve anywhere and anytime, especially while studying at Medan State University. The final curriculum implemented by Medan State University refers to the IQF-based curriculum design with the aim that chemistry education graduates can be qualified and competent, productive, capable and competent to lead learning with full responsibility. Many factors reduce students' interest in learning differential chemistry, namely the subject is difficult to learn and students are unable to learn it . Therefore, Referring to the above research

accompanied by various opinions about the results of the study, the researchers are interested in conducting a study by it is very important for researchers to conduct research on the topic "The Development of Artificial Learning Media to Fasilitate Active Learning to Improve Learning Outcome on The Teaching of Gas Chromatography".

From ancient times until now, the world of education has changed rapidly due to various scientific, technological, social and cultural processes. The curriculum is a guideline for classrooms, teachers and students to direct learning activities to achieve educational goals. The 2013 curriculum provides encouragement to teachers as facilitators who can provide opportunities for students to express themselves to advance (Kemendikbud, 2013). The rapid development of science has caused changes in all fields, including the field of education. One part of education that has changed is learning media. Previously the teacher gave material directly and personally to students on the blackboard, but now much of the material used is the learning environment

Research Method

The flow of research should be presented in this section complete with captions. Image captions placed as part of the image title (figure caption) are not part of the picture. The methods used in completing the study are written in this section. Basically, this section describes the way the research was done. The main materials must be written here: (1) research design; (2) population and samples; (3) sample collection techniques and instrumental development; and (4) data analysis techniques. The specification and type of tools and materials must be written in case the researches have been conducted by using them. The qualitative research, such as classroom action research, case studies, and so forth, need to mention the researcher attendance, research subject, and participated informants, as well as the methods used to explore the data, research location, research duration, and the description of research results validation.

It is suggested that the authors avoid organizing the article content into the smaller parts than second subheading in this section. However, in case of unavoidable factors, the writing style must follow the "Results and Discussion" section.

Result and Discussion

This question was answered by 27 Chemistry Education students class of 2023 at Medan State University using media integrated with the website, resulting in the following data recapitulation. The results were analyzed using the Shapiro Wilk normality test using SPSS 16 to determine whether the data was normally distributed or not. Based on the Shapiro Wilk normality test in Table 4.7 for the critical thinking skills pre-test score, a p-value of 0.227 was obtained so that $0.227 > \alpha = 0.05$. This shows that the pre-test data comes from a normally distributed sample. Likewise, in the post-test of critical thinking skills, a p-value of $0.98 > 0.05$ was obtained, indicating that the data came from a normally distributed sample.

Each indicator of the final learning outcomes shows an increase. The final results of student learning have been achieved after implementing the development of website-based learning media for gas chromatography.

The SPSS analysis results are in Table 4.8, for the post-test score of students' final learning outcomes according to p(Sig.(2-tailed) = 0.000. Because p-value = 0.000 < α = 0.05 then H1 is accepted. This means that there is an influence of media use website-based artificial gas chromatography learning. Next, a t-independent test can be carried out to determine the difference in scores between the PSPK 21 A and PSPK 21 C groups.

Table 1. Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Nilai Siswa	Equal variances assumed	4.448	.040	-13.032	52	.000	-30.000	2.302	-34.620	-25.380
	Equal variances not assumed			-13.032	46.725	.000	-30.000	2.302	-34.632	-25.368

The results of the pre-test and post-test were analyzed based on students' reasons for choosing answers that were in accordance with the four assessment criteria. It can be seen that the final student learning results have increased from the average pre-test result of 70.65 to 124.26 in the post-test result. Comparison of pre-test and post-test in the assessment . The final results of student learning scores are in the "very good" category after using learning media made by integrated Gas Chromatography Website.

It can be seen that the highest pre-test score is 120 and the lowest pre-test score is 35, while the highest post-test score is 150 and the lowest post-test score is 90. Data can be presented as student learning outcomes derived from post-test scores. Student learning completeness is measured by competency achievement as seen from their learning outcomes. Student learning achievement is obtained from pre-test and post-test scores, assessment scale range 0-100. Students who achieve learning outcomes >75 are classified as competent. And

also The Media Website was validated by two material experts and two media expertsby filling out a questionnaire adapted to eligibility standards by BNSP. Then the website media developed is revised into a valid website. Appropriateness of the material in terms of content/material, presentation, and language in the website, validators obtained were 95,36% on website media very valid category. Media appropriateness in graphic design, The validator score was 97,02% in the very valid category. with the conclusion that the material and media on this website with gas chromatography material are suitable for use a learning material.

The analysis stage requires analysis of lecturer needs, semester learning plans, and website media characteristics. Analyze the needs earlier carried out at the beginning of the research to find out information about Analytics implementation Chemistry learning in the second gas chromatography material theoretically in class. Needs analysis questionnaire given to lecturers Analytical Chemistry, Chemistry Education Review Medan State University program to find out about this achieving learning goals, student learning interests, learning obstacles, library availability facilities and infrastructure, implementation learning activities, application of virtual practicum, and students' skills in the classroom. Based on One of the results of the analysis of lecturer needs The obstacle in learning Analytical Chemistry is that material is too broad. This is in line with Mega Feronika (2022), chemistry is part of basic science subjects delivered through scientific means approach, and students find it difficult to deal with it because the concept is complex and abstract. As a result, this must be conveyed through learning experiences. That way students will get information directly experience and can be more easily understood and understand the knowledge he learns, but sometimes students face some obstacles in carrying it exit learning activities.

The research on the development of artificial learning media that I have researched to improve learning outcomes in gas chromatography material refers to research results that appear to be effective. Judging from the pretest and posttest results and continuing with relevant previous research such as research entitled The Development Of Virtual Laboratory To Improve Student Critical Thinking Skills On The Teaching Of Gas Chromatography And Development Of E-Module Integrated With Virtual Laboratory On Acid-Base Titration Of Material To Improve Critical Thinking Skills which is very relevant to the development research.

Conclusion

Students are given 30 multiple choice questions with a score of 5 for each correct answer. The results of the pre-test and post-test scores by 27 students of the 2021 Chemistry Education Study Program. It can be seen that the highest pre-test score is 120 and the lowest pre-test score is 35, while the highest post-test score is 150 and the lowest post-test score is 90. Data can be presented as student learning outcomes derived from post-test scores. Student learning completeness is measured by competency achievement as seen from their learning outcomes. Student learning achievement is obtained from pre-test and post-test scores, assessment scale range 0-100. Students who achieve learning outcomes >75 are classified as competent (Sutiani et al., 2021).

Website-based artificial learning media on Gas Chromatography material to measure learning outcomes can improve student learning outcomes on Gas Chromatography material. This is in line with several studies which show that the use of this website has a positive impact on improving the quality of the process and student learning outcomes.

Recommendation

For further research, it is best to implement the development of artificial learning media that is integrated with website media which is equipped with motivation and results of students' critical thinking. For further research, the development of artificial learning media that is integrated with website media can be replaced with others virtual laboratory available in Indonesian. For further research, it is best to add experiments with different materials or experiments on this gas chromatography material.

References

Ali, M., & Asrori, M. (2022). Metodologi dan aplikasi riset pendidikan. Bumi Aksara.

Ayala-Cabrera, J. F., Montero, L., Meckelmann, S. W., Uteschil, F., & Schmitz, O. J. (2023). Review on atmospheric pressure ionization sources for gas chromatography-mass spectrometry. Part II: Current applications. Analytica chimica acta, 1238, 340379.

Børte, K., Nesje, K., & Lillejord, S. (2023). Barriers to student active learning in higher education. Teaching in Higher Education, 28(3), 597-615.

Cagliero, C., Bicchi, C., Marengo, A., Rubiolo, P., & Sgorbini, B. (2022). Gas chromatography of essential oil: State-of-the-art, recent advances, and perspectives. Journal of Separation Science, 45(1), 94-112.

Chance, P., & Furlong, E. (2022). Learning and behavior: Active learning edition. Cengage Learning.

Dewi, R. K., Wardani, S., Wijayati, N., & Sumarni, W. (2019). Demand of ICT-Based Chemistry Learning Media in the Disruptive Era. International Journal of Evaluation and Research in Education, 8(2), 265-270.

Fadilah, A., Nurzakiyah, K. R., Kanya, N. A., Hidayat, S. P., & Setiawan, U. (2023). Pengertian Media, Tujuan, Fungsi, Manfaat dan Urgensi Media Pembelajaran. Journal of Student Research, 1(2), 01-17.

Gargenta, M. (2011). Learning android. " O'Reilly Media, Inc."

Haase, S., Tolvanen, P., & Russo, V. (2022). Process intensification in chemical reaction engineering. Processes, 10(1), 99.

Halvorsen, R. C., Trinklein, T. J., Warren, C. G., Rogan, R. D., & Synovec, R. E. (2023). Optimizing column-to-column retention time alignment in high-speed gas chromatography by combining retention time locking and correlation optimized warping. Talanta, 254, 124173.

Kariuki, J., Nguyen, T. V., & Singh, R. (2023). Reflections of a professor and undergraduate student-instructors: Our experiences teaching a first-year seminar course and chemistry labs. International Journal for Students as Partners, 7(1), 191-197.

Keyvanpour, M. R., Barani Shirzad, M., & Heydarian, F. (2023). Android malware detection applying feature selection techniques and machine learning. Multimedia Tools and Applications, 82(6), 9517- 9531.

Mahardika, I. K., Subiki, S., Anggraeni, N. P., Juanda, D. H., Ubaidillah, M. J., & Amelia, N. (2022). Analisis Penggunaan Media Pembelajaran Interaktif Berbasis Lingkungan untuk Meningkatkan Hasil Belajar Siswa SMA pada Materi Fluida Dinamis. EDUKATIF: JURNAL ILMU PENDIDIKAN, 4(4), 5239-5247.

McNair, H. M., Miller, J. M., & Snow, N. H. (2019). Basic gas chromatography. John Wiley & Sons.

Nolvachai, Y., Zavahir, J. S., Herron, R., & Marriott, P. J. (2023). Teaching Analytical Instrumentation Through Remote Access–A Gas Chromatography Perspective. Journal of Chemical Education, 100(3), 1100-1108.

Nurbani, N., & Puspitasari, H. (2022). Analisis Kebutuhan Pengembangan Media Pembelajaran Berbasis Android pada Mata Pelajaran Matematika di SMA. Edukatif: Jurnal Ilmu Pendidikan, 4(2), 1908- 1913.

Putri, S. P., Ikram, M. M. M., Sato, A., Dahlan, H. A., Rahmawati, D., Ohto, Y., & Fukusaki, E. (2022). Application of gas chromatography-mass spectrometry-based metabolomics in food science and technology. Journal of Bioscience and Bioengineering.

Rachma, N., & Muhlas, I. (2022). Comparison Of Waterfall And Prototyping Models In Research And Development (R&D) Methods For Android-Based Learning Application Design. Jurnal Inovatif: Inovasi Teknologi Informasi Dan Informatika, 5(1), 36-39.