LEARNING MANAGEMENT SYSTEM AND STUDENTS' HEALTH BEHAVIOUR IN SECONDARY SCHOOLS IN AKWA IBOM STATE

Ema, Moses Akpan, Umoren, Victoria Ikoobong and Udoma, Christiana Aniekan
Department of Human Kinetics and Health Education, Faculty of Education, University of Uyo, Akwa Ibom State.

Abstract
The use of learning management system (LMS) has been expected to have effect on students' health behaviour most especially in secondary schools in Akwa Ibom State. Learning management system has the potential to improve the overall quality of health education delivery and contribute to the achievement of national goals for adolescent health and development. The researchers investigated the effectiveness of using Moodle integrated with AI-driven plugins in teaching health education. A quasi-experimental design was adopted. The population comprised all Junior Secondary Two (JS2) students in public secondary schools. The instrument for data collection was the HealthBehaviour Knowledge and Practice Questionnaire (HBKPQ) *developed by the researcher. The instrument was validated by three experts in Health Education and Measurement and Evaluation. Its reliability was established using Cronbach Alpha, which yielded a coefficient of 0.82. The experimental procedure involved teaching the experimental group with Moodle integrated with AI-driven plugins, while the control group was taught using the conventional classroom method. Data collected were analyzed using mean, standard deviation, and Analysis of Covariance (ANCOVA). Findings showed that students taught with the AI-driven learning management system demonstrated significantly better knowledge of health behaviour compared to those taught conventionally. However, no significant difference was found in health behaviour between male and female students. The finding also that the mean knowledge of health behaviour of students taught using AI-driven learning management system was 16.38, while that of students taught using conventional classroom method was 7.79. Also, the result shows that the mean health behaviour gain scores of male students taught health education was 12.13, while that of female students was 12.22. The study concluded that AI-driven LMS is effective in promoting health behaviour among students. It recommended that students embrace digital platforms, teachers integrate AI-driven LMS into teaching, and policymakers support digital learning in schools.*

Keywords: AI-driven learning, Health behaviour, Moodle, AI-plugins

Introduction
Health education has remained one of the most important aspects of the school curriculum because it equips learners with the knowledge, skills, and attitudes they need to live healthy lives. For students in secondary schools, who are in the adolescent years, health education is particularly vital. At this stage of development, young people begin to make independent choices about their bodies, lifestyles, and relationships. These choices,

whether good or bad, shape their physical and mental well-being in profound ways. The aim of health education is not only to pass on theoretical knowledge but also to help students adopt practices that will keep them safe from diseases, enable them to maintain good hygiene, promote sound nutrition, and discourage risky behaviours such as drug abuse, unsafe sexual practices, and violence (WHO, 2020). By instilling positive health behaviour, health education helps students develop the foundation for lifelong wellness, which in turn improves their academic achievement and overall quality of life.

Unfortunately, in many secondary schools across Nigeria, including those in Akwa Ibom State, the health behaviour of students continues to be a major concern. Reports from teachers, parents, and health professionals point to common patterns of poor health practices among students. These include irregular handwashing, poor menstrual hygiene management, unhealthy eating habits, low levels of physical activity, and in some cases, engagement in risky sexual practices (Adebayo and Makinde, 2019; Ekanem, 2021). Drug abuse and substance use are also becoming more widespread among adolescents, leading to negative physical, social, and emotional outcomes. Such poor health behaviours not only put students at risk of illnesses but also reduce their concentration in school, increase absenteeism, and lower their learning outcomes (Obi and Okafor, 2020). When students are not in good health, it becomes almost impossible to achieve the goals of health education, no matter how well the curriculum is designed.

Part of the challenge is that health education in secondary schools is often delivered through conventional teaching methods that emphasize rote learning and teacher-centered instruction. In many cases, teachers depend heavily on chalk-and-talk methods or simple textbook explanations to convey critical health information. While this approach may transfer theoretical knowledge, it often fails to connect meaningfully with the lived realities of students. Health education is meant to influence behaviour, yet lectures alone rarely succeed in changing how students actually live their daily lives (Ogunleye and Adebayo, 2018). Students may memorize definitions of hygiene, nutrition, or exercise but still fail to apply them outside the classroom. Furthermore, large class sizes, limited teaching resources, and poor student-teacher interaction make it difficult for teachers to give personalized attention to students who need more guidance in adopting healthy practices. This shows the urgent need for more innovative and engaging approaches to teaching health education in Nigerian schools.

In recent years, technology has offered new opportunities to transform the teaching and learning process, making it more interactive, student-centered, and effective. Digital platforms can provide multimedia resources such as videos, animations, and interactive quizzes that bring health concepts to life in ways that conventional teaching cannot (Siemens, 2014). Technology also supports continuous learning, since students can access materials anytime and anywhere, even outside school hours. More importantly, the rise of artificial intelligence (AI) has created tools that can personalize learning to suit the unique needs, pace, and learning style of each student (Luckin et al., 2016). This is particularly useful in health education, where students may need different levels of support to change their behaviour. For example, some students may need constant reminders about hygiene, while others may require in-depth guidance on nutrition

or reproductive health. AI-driven systems can track each learner's progress, provide timely feedback, and suggest personalized learning activities that encourage positive behavioural change.

Among the various technology platforms available for teaching and learning, Moodle stands out as a flexible and widely used learning management system. Moodle is an open-source platform that allows teachers to create online courses, upload learning materials, and monitor student progress. What makes Moodle more powerful today is its ability to integrate AI-driven plugins that enhance its capacity for adaptive learning, real-time feedback, and data-driven decision-making (Holmes et al., 2019). With AI-driven plugins, Moodle can automatically analyze students' engagement with health education content, identify areas where they are struggling, and recommend additional resources or exercises. It can also generate learning analytics that help teachers understand the behavioural patterns of students, such as how often they engage with health-related modules, how much time they spend on learning, and whether they are improving in their understanding and application of healthy practices.

In the context of this study, Moodle integrated with AI-driven plugins will be used to deliver instructional content on key aspects of health behaviour such as personal hygiene, nutrition, substance abuse prevention, and emotional well-being. The system will present lessons in engaging formats such as videos, infographics, and interactive quizzes. Students will be able to learn at their own pace while the AI system adapts the difficulty of tasks to match their level of understanding. For instance, a student struggling with the concept of balanced diet will receive additional examples, simplified explanations, and practice quizzes until mastery is achieved. Another student who has already mastered the topic will be given more advanced tasks that challenge them to apply the knowledge in real-life situations. Through this approach, Moodle with AI plugins ensures that no student is left behind and that health education is not reduced to memorization but linked to meaningful behavioural change.

The importance of using an AI-driven learning management system in teaching health education cannot be overemphasized. Research has shown that when students are actively engaged in digital learning environments, their retention of knowledge and ability to apply it in real life improves significantly (Alalwan et al., 2019). Furthermore, AI-driven systems are able to provide data that guide teachers in making timely interventions. For example, if the system detects that a student is consistently skipping lessons on hygiene or failing assessments on substance abuse, the teacher can quickly step in to provide additional guidance or counseling. Such personalized interventions are rarely possible in conventional classroom settings due to large student numbers and limited instructional time. Thus, integrating AI into Moodle provides both the teacher and the student with tools that promote effective learning and long-term behavioural change.

This study was designed to determine the effectiveness of Moodle integrated with AI-driven plugins in helping students develop good health behaviour in secondary schools in Akwa Ibom State. By comparing students taught with the AI-driven Moodle platform and those taught through traditional classroom methods, the study will provide evidence on

whether technology can bridge the gap between knowledge and behaviour in health education.

Methodology

The study adopted a quasi-experimental research design, specifically the pretest-posttest control group design. This design was considered appropriate because it allowed the researcher to compare the effect of an AI-driven learning management system with that of conventional teaching methods on students' health behaviour. The design enabled the researcher to establish cause-and-effect relationships by exposing one group of students to instruction through Moodle integrated with AI-driven plugins (experimental group), while the other group received instruction through conventional methods (control group).

The study was carried out in secondary schools located in Akwa Ibom State, Nigeria. The state was chosen because of the rising concerns about the health behaviour of adolescents, particularly in relation to hygiene, nutrition, drug use, and risky practices. Akwa Ibom State has both urban and rural secondary schools, which provided a diverse setting for examining how AI-driven instruction could impact students' health behaviour.

The population of the study comprised all Junior Secondary Two (JS2) students in public secondary schools in Akwa Ibom State. This group was selected because students in JS2 are at an important developmental stage where they are exposed to peer influence and begin to adopt health behaviours that can last into adulthood. They were also considered suitable because health education is included in their curriculum.

The sample for the study consisted of 286 JS2 students drawn from six public secondary schools in Akwa Ibom State. A purposive sampling technique was first used to select schools that had the facilities to support digital learning. Afterward, a simple random sampling technique was used to select participants from the schools. Out of the six schools, three schools were taught using Moodle integrated with AI-driven plugins (the experimental group), while three schools were taught using conventional classroom methods (the experimental group).

The instrument used for data collection was a Health Behaviour Questionnaire (HBQ) developed by the researcher. The instrument was designed to measure students' knowledge, attitudes, and practices related to health behaviour. It contained three sections: the first section focused on students' demographic information, the second section assessed students' knowledge and attitudes towards health behaviour, and the third section assessed students' self-reported practices in areas such as hygiene, nutrition, drug use, and physical activity. The questionnaire items were structured on a Likert-type scale for easy quantification of responses.

The instrument was subjected to face and content validation. Three experts—two in Health Education and one in Educational Measurement and Evaluation from the University of Uyowere requested to review the instrument. They examined the items to ensure they were clear, appropriate, and capable of measuring the intended constructs. Their feedback was used to refine and improve the questionnaire before it was administered to the participants.The reliability of the instrument was determined using the Cronbach Alpha method. A pilot test was conducted with 30 JS2 students who were not

part of the study sample. The data obtained from the pilot test were analyzed, and a reliability coefficient of 0.82 was obtained. This indicated that the instrument was reliable and suitable for use in the main study.

The study was carried out over a period of six weeks. At the beginning, both the experimental and control groups were given a pretest using the Health Behaviour Questionnaire to establish their baseline knowledge, attitudes, and practices. The experimental group was then introduced to Moodle integrated with AI-driven plugins. They were taught selected health education topics such as hygiene, nutrition, drug abuse prevention, and emotional well-being through interactive multimedia content, adaptive quizzes, and personalized feedback generated by the AI system. The control group, on the other hand, was taught the same content using conventional classroom methods such as lectures and discussions. At the end of the instructional period, a posttest was administered to both groups using the same instrument.

The data collected were analyzed using both descriptive and inferential statistics. Mean and standard deviation were used to answer the research questions, while Analysis of Covariance (ANCOVA) was used to test the null hypotheses at a 0.05 level of significance. The pretest scores served as covariates in the analysis to control for initial group differences. This statistical approach helped to determine whether the observed differences in posttest scores between the experimental and control groups could be attributed to the treatment.

Result

Hypothesis 1: There is no significant effect of AI-driven learning management system on students' knowledge of health behaviour in secondary schools in Akwa Ibom State.

Table 1a: Analysis of Covariance of the Main Effect of Teaching Method on Students'Knowledge of Health Behaviour

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	12000.868[a]	2	6000.434	151.091	.000
Intercept	12028.068	1	12028.068	302.867	.000
Pretest	6868.130	1	6868.130	172.940	.000
TM	5209.123	1	5209.123	131.166	.000
Error	11239.051	283	39.714		
Total	939843.000	286			
Corrected Total	23239.920	285			

a. R Squared = .516 (Adjusted R Squared = .513)

The result in Table 1a indicated that the calculated F-value of 131.166 for the main effect of method of teaching on students' knowledge of health behaviour in secondary schools in Akwa Ibom State is significant. This is because the p-value of .000 is

less than .05 level of significance at 1 and 283 degrees of freedom. Therefore, the null hypotheses which stated that there is no significant main effect of method of teaching on students' knowledge of health behaviour in secondary schools in Akwa Ibom State is rejected. Hence, there is a significant main effect of method of teaching on students' knowledge of health behaviour in secondary schools in Akwa Ibom State.

Table 1b: Mean Score of Students in Knowledge of Health Behaviour

Group	N	Pre-test		Post-Test		Gain Score
			SD		SD	
AI-Driven LMS	146	44.38	9.11	60.76	8.80	16.38
Conventional Method	140	44.50	6.06	52.29	7.03	7.79

The result in Table 1b indicates the mean performance gain scores of students' knowledge of health behaviour taught using AI-driven learning management system and conventional classroom method. The result shows that the mean knowledge of health behaviour of students taught using AI-driven learning management system was 16.38, while that of students taught using conventional classroom method was 7.79. The mean gain score difference between the two groups is 8.59 in favour of students taught using AI-driven learning management system. Therefore, students taught Health Education using AI-driven learning management system had a better knowledge of positive health behaviour than those taught using conventional classroom method.

Hypothesis 2: There is no significant effect of gender on students' knowledge of health behaviour in secondary schools in Akwa Ibom State.

Table 2a: Analysis of Covariance of the Effect of Gender on Students' Knowledge of HealthBehaviour

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	6791.763[a]	2	3395.882	58.428	.000
Intercept	12195.478	1	12195.478	209.830	.000
Pretest	6791.389	1	6791.389	116.850	.000
Gender	.018	1	.018	.000	.986
Error	16448.156	283	58.121		
Total	939843.000	286			
Corrected Total	23239.920	285			

a. R Squared = .292 (Adjusted R Squared = .287)

The result in Table 2a indicates that the F-value of .000 for the main effect of gender on students' knowledge of health behaviour in secondary schools in Akwa Ibom State is not significant. This is because the p-value of .986 is greater than .05 level of

significance at 1 and 283 degrees of freedom. Therefore, the null hypothesis which stated that there is no significant effect of gender on students' knowledge of health behaviour in secondary schools in Akwa Ibom State is accepted.

Table 2.b: Mean Score of Students in Knowledge of Health Behaviour Based on Gender

Group	N	Pre-test		Post-Test		Gain Score
			SD		SD	
Male	155	44.52	8.73	56.65	9.10	12.13
Female	131	44.35	9.49	56.57	8.98	12.22

The result in Table 2b indicates the mean health behaviour gain scores of male and female JS2 students. The result shows that the mean health behaviour gain scores of male students taught health education was 12.13, while that of female students was 12.22. The mean gain score difference between the two groups is 0.9 in favour of female students. Therefore, female students taught health education using AI-driven learning management system performed equivalent to their male counterparts in knowledge of positive health behaviour.

Discussion of Findings

The finding of this study showed that students who were taught health education using the AI-driven learning management system had a better knowledge of health behaviour than those taught with the conventional classroom method. This result suggests that digital platforms with artificial intelligence can improve the teaching and learning of health education. One possible reason for the finding could be that the AI-driven system provided interactive and engaging content such as videos, quizzes, and adaptive feedback, which made learning easier to understand and remember. In contrast, conventional teaching often depends on lectures and memorization, which may not hold students' attention or encourage deep learning.Another reason for the better performance of students exposed to AI-driven instruction could be the system's ability to personalize learning. The Moodle platform with AI plugins adjusted the pace and type of learning activities to suit the needs of each learner. This made it easier for students to grasp difficult concepts and apply them to real-life situations. Previous studies have reported similar results. Alalwan et al. (2019) found that technology-based learning improved students' academic performance because it encouraged participation and independent learning. Luckin et al. (2016) also argued that artificial intelligence in education supports personalization, which increases students' knowledge retention. Holmes et al. (2019) further confirmed that AI-driven systems help teachers to track progress and provide timely support, leading to better student outcomes.

The finding of this study showed that students did not significantly differ in their health behaviour based on gender. This suggests that both male and female students responded to health education in similar ways when exposed to the same learning experiences. A possible reason for this result could be that health challenges and risky behaviours faced by adolescents, such as poor hygiene, drug use, and unhealthy eating habits, are common to both boys and girls. Since they are exposed to the same school

environment and peer influences, their health behaviours tend to be alike.Another explanation could be that the AI-driven learning management system presented the same interactive and engaging content to both male and female students. The system did not discriminate by gender but provided equal opportunities for learning and practice. This may have helped to reduce differences that could have arisen from social or cultural expectations about gender roles.This finding is in line with earlier studies. Ekanem (2021) reported that adolescents in Nigerian schools often display similar patterns of health behaviour regardless of gender. Similarly, Obi and Okafor (2020) found no significant gender differences in students' adoption of hygiene and nutrition practices in South-Eastern Nigeria. These studies suggest that factors such as peer pressure, school environment, and access to health information may play a greater role in shaping adolescent health behaviour than gender differences.

Conclusion

The study concluded that the use of an AI-driven learning management system, specifically Moodle with AI plugins, enhanced students' knowledge of health behaviour more effectively than conventional classroom teaching. However, students did not differ significantly in their health behaviour based on gender. This suggests that technology-based instruction can improve learning outcomes for all students equally. The findings highlight the potential of integrating AI-driven platforms into health education to promote positive health behaviour among secondary school students in Akwa Ibom State.Based on the findings of the study, the following recommendations were made;

i. Students should embrace the use of AI-driven learning platforms for health education in order to build better knowledge and practice positive health behaviours.
ii. Teachers should integrate AI-driven learning management systems like Moodle into their health education lessons.
iii. Policymakers should support the inclusion of digital learning strategies in the curriculum to improve students' health behaviour across schools.

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