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Secondary School Teachers' Perceptions of Steam Delivery with Learning Management Systems in Oyo Town

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A B S T R A C T
Empirical evidence revealed that secondary school students have low learning outcomes in Science, Technology, Engineering, Arts and Mathematics (STEAM). Learning Management Systems (LMSs) have proven impacts on STEAM as individual subjects, however, the perceptions of the secondary school teachers on STEAM education delivery with LMSs can mar or make the acceptance and adoption of the innovative strategy in schools. Therefore, the study investigate the secondary school teachers' perceptions of STEAM delivery with LMSs in Oyo town. Mixed methods type of descriptive survey research in concurrent triangulation was adopted for the study. Two research questions and five hypotheses guided the study.240 public and private secondary school STEAM teachers were selected by cluster random sampling technique. Two adopted research instruments; Secondary School Teachers' Perceptions of Enhancing STEAM with Learning Management System Questionnaire (SPESLQ, R=.83) and Secondary School Teachers' Perceptions of Enhancing STEAM with Learning Management System Interview (SPESLI, IRR=.79) were used for data collection. Collated data was analyzed using thematic analysis, t-test and ANOVA. Results revealed that the secondary school teachers have very high perceptions of enhancing STEAM with LMSs. The perception was significant (N=223.00, Mean= 72.29; SD= 7.87; df=222; t= 137.12; p<05). However, the perception was not significantly different based on gender, school types, age, subject taught and level of education. Therefore, Learning Management System was recommended for all categories of secondary school teachers to enhance STEAM education.

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Introduction

Science, Technology, Engineering, Arts and Mathematics (STEAM) hold an enviable and indispensable position in the attainment of individual, national and international sustainability. Science which is the ancestor of technology, engineering, arts and mathematics is the activity culminating into a testable, verifiable and falsifiable body of knowledge (Olagunju, Bolaji & Adesina, 2013), Technology as an offshoot of science is art or craft in tool utilization for the solving of mankind problems. Engineering has to do with fabrication, design and construction of projects or objects to perform a specific purpose. Arts has the conception of the entity in the society that have to do with the structure, design and beauty of natural and artificial objects in the universe, Arts in this context involves the social studies that envisage human interrelationships and social structures, the fine and applied arts which deals with beauty in design and construction, also, the arts has elements of music which is the universal language understandable by

all. It adds beauty and spices to nature. Mathematics is the science of number, it studies pattern and structure of arrangement in nature, it touches almost all human endeavours be it in commerce, industry, communication, transportation, law, education and every other spheres of human endeavours. The conglomeration of Science, Technology, Engineering, Arts and Mathematics to form STEAM is a novel development in the right direction. The amalgam of STEAM as a single subject to be taught at secondary schools would avail the learners opportunities to internalize the five subjects as one just as nature is never compartmentalized but centralized as one unified structure of understanding to engender the lerners' critical thinking, creativity, collaboration, communication, digital literacy, citizenship, problem solving, self-regulation, knowledge construction and many other positive skills in life (Adesina, 2022; Adesina et al., 2023; Niu et al., 2023; Zhan et al., 2023; Batool & Lodhi, 2024; Vachhiyat & Tandel, 2025; Yulianti et al., 2024).

There are cross-cutting contents in science, technology, engineering, arts and mathematics which when treated together presents a holistic knowledge that aids optimum comprehension of phenomenon in nature, Such cross-cutting concepts are energy, atom, environment, measurement and the likes. The students for instance pick the holistic knowledge of energy as idealized in science, energy as utilized in technology and engineering, the energy in arts as well as measurement and calculation of energy in mathematics, Such all round exposure of ideas, knowledge and skills to the students make the learners more fuctional and pragmatic to the extent of adapting the knowledge to solve real world problems.

Evidence in research showed that secondary school students have not been performing beyond average in Science, Technology, Engineering, Arts and Mathematics when taught as unintegrated, individual subject (Olagunj & Adesina, 2017; Obanya, 2021; Okebukola, 2021). However, would the students perform better in the subjects if taught together using the same didactic, conventional, non-heuristic approach? Actually, the appalling students' performance and aversive attitude towards Science, Technology, Engineering, Arts and Mathematics cannot be estranged from the method adopted in teaching the subjects, thus, need to source a better knowledge, ideas, and skills delivery systems in the novel construct, STEAM. Such innovative and highly impactful system of educational delivery is Learning Managent System (LMS).

Learning Management System (LMS) is a technological application software that allows the contents of instruction to be embedded in technological modules, laiden with videos, audios, assignments, games, quizzes, forum discussion, collaboration and system analytics that present the learners' performance in systematic, well arranged manner (Adesina et al, 2023; Odekeye et al, 2023; James and Courage, 2024; Salas-rueda & Alvarado-zamorano, 2024). LMS enhances, enriches, enables and empowers both the instructional facilitator and students in active engagement and interactivity. It allows both synchronous and asynchronous instruction in blended or flipped instructional approaches. Learning Management System presents instruction in bits of large chunk of contents of instruction, the contents of instruction is subjected to Instructional System Design (ISD) which systematically analyse, design, develop, implement and evaluate the instructional contents to facilitate students optimum comprehension and understanding of the contents of instruction (Adesina, 2022; Badmus, 2012; Gambari, 2021).

Theoretically, LMSs are premised on the contructivists' learning theory of Glerserfeld, Vygostky, Bruner, Dewey (Ehindero, 2014) that suggests that learners construct knowledge out of their experiences. Bruner (1986); Gagne (1985) and Piaget (1973) believed that such knowledge constructed would find useful links with previous ones and utility LMS is a technological package that employed instructional design like ADDIE (Analysis, Design, Development, Implementation and Evaluation). The succinct design of the instruction in LMS proceed on enquiry mode where questions are presented, prompting thinkability and reflections on the identified learning objectives that aids knowledge construction. The LMSs allow the learners to learn, re-learn, over-learn and debug (de-learn) inconsistency in learning. it allows the process of assimilation of facts along with accommodation of new learning ideas in the course (Dewey, 1939). Perception is the end product of the interaction between stimulus and internal hypotheses, expectations and knowledge of the observer, while motivation and emotions play an important role in this process. Perception is thus influenced by a wide range of individual factors that can lead to an inadequate interpretation. (Eysenck & Keane, 2008). LMSs sustains learning interest to the extent that the learners can decode the encoded instruction and construct such in their own ideas which makes their learning

relatively-permanent as they change their behaviour (learning outcomes).

Also, theoretically, the study on learning management system in Basic STEAM education is premised on the behaviourists' learning theory which states that learning is a behavioural pattern structured in Stimulus – Organism – Response pattern. Normally, the learning management system presents an unconditional stimulus which rationally produces an unconditioned response when interpreted, the learning management system packaged STEAM contents instruction using ISD like ADDIE (Analysis, Design, Development, Implementation and Evaluation) to present STEAM to basic learners, such would facilitate enhanced and empowered learners and facilitators with high interactivity and engagement. Empirically, Holmes and Prieto-Rodriguez (2018) investigated student and staff perceptions of a learning management system for blended learning in teacher education focusing on accessibility and interactivity of the LMS. A descriptive survey design was adopted for the research. 46 staff and 470 undergraduate and postgraduate faculty of education students were sampled. Differences were found between student and staff perspectives in relation to accessibility of online materials, with students rating its contribution to their learning higher than staff. However, the two groups held similar perspectives with regards to the effectiveness of LMS tools to enable interactivity.

Taufiqurrochman, Muslimin, Rofiki and Abah (2019) described students' perceptions as users of the LMS application. The study was descriptive research. 150 students involved in this study, 75 percent chose the blended learning model for learning Arabic. The results of students' perceptions regarding these features indicate that they understand all the functions of the LMS features. About learning Arabic, they assessed that all LMS applications had the potential to be used for learning Arabic. The most significant potential is the ability of the LMS application in enhancing learners speaking, writing, and grammar capability. Nguyen (2021) in a study on satisfaction of users towards learning management system at international University Vietnam National University HCMC found that there is significant impact of LMS on students' learning satisfaction including improved interaction and relationships building and sustenance in lesson and an invariable increase in perception of LMS effectiveness. Kant, Prasad and` Anjali (2021) researched into selecting an appropriate learning management system in open and distance learning: a strategic approach identified that LMSs are of various types and sources and makes the decision- making as regards selection of an appropriate LMS strategically crucial requiring adequate consideration of every aspect such as cost, quality, usage, capacity, budget and most importantly priorities and objectives and the students and instructional facilitators perceived that LMS impacts positively on learning outcomes.

Al-Sharhan, Al-Hunaiyyan, Alhajri and Al-Huwail (2021) explored the utilization of Learning Management System (LMS) among instructors and students a case study conducted to identify the utilization of LMS in the Gulf University for Science and Technology (GUST). The results indicated a low percentage of the utilization of LMS functions, in which web-based LMS is more utilized than mobile-based LMS and found that when LMS is used as a pedagogical tools rather than as an administrative one, the students performed better and perceived the software as more efficient and effective instructional package. Ajijola, et al. (2021) investigate the perception of learning management system among distance learners' in South-West, Nigeria. Emphasis was on gender and field of study using an adapted Technology Acceptance Model (TAM), descriptive research method was adopted, data were collected through the administration of a-validated researcher-adapted questionnaire. Descriptive statistics of mean and standard deviation were used to answer research questions one and two. Inferential statistics of t-test and ANOVA. The findings indicated that there were significant differences between male and female distance learners in their perceived usefulness of LMS, perceived ease of use of LMS in favour of males; there was no significant difference among Sciences, Arts and Social Science distance learners on their perceived usefulness and perceived ease of use of LMS. Odekeye et al. (2023) studied the perception of learning management system (LMS) on the academic performance of undergraduate students during the COVID-19 Pandemic found that the students have a high perception of LMS impacts on their academic performance The study equally found a significant difference in undergraduate students' perception of the use of LMS in instructional delivery based on gender, class levels and area of speciliasation.

Yulianti et al. (2024) explored Indonesian science teachers' perspectives on STEAM learning across four dimensions: understanding, experience, state of mind, and expectations. Surveying 448 teachers from 24

provinces, findings reveal limited STEAM understanding and insufficient guidance from existing frameworks. Teachers seek clearer frameworks, practical examples, and better support to effectively integrate STEAM into education. James and Courage (2024) examined teachers' attitudes toward learning management system (LMS) adoption in Delta State secondary schools using a descriptive survey. With 361 respondents, data analysis showed generally positive attitudes and no gender-based differences. The study recommends continued investment in LMS integration to enhance teaching and learning across schools. Salas-rueda and Alvarado-zamorano (2024) analyzed 115 Mexican teachers' perceptions of LMS use during COVID-19, using data science techniques. Results show LMS positively impacted learning, motivation, and student participation. Decision tree models revealed academic level and sex influenced LMS use. The study concludes LMS enables creative teaching, educational innovation, and effective virtual learning spaces amid pandemic challenges.

Batool and Lodhi (2024) explored teachers' perceptions of the STEAM approach in Bahawalpur, using a quantitative method with 50 teachers (25 male, 25 female). Findings show teachers are aware of STEAM's value in teaching applied skills, though challenges in evaluation and support remain. Despite difficulties, teachers favor STEAM and seek training and resources for effective implementation. Vachhiyat and Tandel (2025) investigated secondary school teachers' perceptions of STEAM education and challenges in implementation. Surveying 50 teachers, it examined attitudes, perceived benefits, and barriers. While teachers value STEAM for fostering critical thinking and interdisciplinary skills, limited resources, insufficient training, and weak administrative support hinder adoption. Recommendations include professional development, increased resources, and stronger institutional support.

Some socio-demographic factors of the secondary school teachers can moderate their perceptions of enhancing STEAM with Learning Management Systems (LMSs). Factors like gender, type of school, age and subjects taught are potent enough to influence teachers perception (Afolabi et al., 2018; Adesina & Adesina, 2022). While Ndirika (2013); Bamidele (2018) reported gender. difference in students' performance in schools the reverse is the influence of gender on students' perception of experimental method (Raimi, Bolaji and Adesina, 2016; Wonu & Anakwe, 2014). Yu (2021) findings regarding gender differences in online learning outcomes tend to be inconsistent and even paradoxical regards online learning perseverance and engagement. A similar finding was reported by Lu (2021) that students' perceptions of a blended learning environment to promote critical thinking has inconsistent gender effects. This engenders need for further clarification on gender influence on secondary teachers perception of enhancing STESAM with LMSs. Secondary schools are owned by either the government (public) or by the private ownership. Will the school type influence the teachers' perception of enhancing STESAM with LMSs.. Age is another variable that can easily differentiate individual(s) behaviour or perception of an innovative strategy (Gonzalez, Famirez & Viadel, 2015; Fleming; Mason & Paxton, 2018; Staddon, 2020). Ma, Chan and The (2020) found from a generational perspective the older adult behaviour model more effective than the young behaviour model in increasing self-efficacy to ICT methodology. Similar result was reported by Gomez-Garcia et al (2020) that age differentiated mathematics teachers on ICT training and use perceptions.. Will similar trend be obtained on secondary school teachers' perception of enhancing STEAM with LMSs/ This study unravel this. STEAM is a conglomerate of five main subjects, Science, Technology, Engineering, Arts and Mathematics, will secondary school teachers' perception of enhancing STEAM with LMSs be influenced by the subject taught? This study examines this.

Statement of the Problem

Science, Technology, Engineering, Arts and Mathematics (STEAM) have not been taught as a single subject in Nigeria, the precursor subject, Science, Technology, Engineering and Mathematics (STEM) lacks the socio-cultural concepts in arts such as cultural creative arts, music, social studies and the like that can revolutionize the world of creativity, critical thinking, knowledge construction and global development. Evidence abound that when the cross-cutting concepts are taught in unison as in STEAM, the students learn better, comprehend easily and have high level of creativity, knowledge construction, self-regulation, collaboration, communication, critical thinking and real world problem solving skills. Evidence equally abounds that Learning Management Systems (LMSs) raises learners' learning outcomes in STEAM. However, the perceptions of teachers influences the behavior and normal acceptance of

innovative instructional strategies like LMSs. A positive high perception enhances the adoption of innovation whereas a negative perception is inimical to innovative strategy like LMSs. Thus, the need to study secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town. Secondary school teachers in STEAM are male or female, will there gender becloud their perception of LMSs STEAM delivery? This study investigate this. The subject handled by these teachers, science, technology, engineering, arts or mathematics, will it moderate their perception of LMSs being used in STEAM delivery, this is equally evaluated in the research.

Objectives of the Study

The main thrust of the research is to investigate secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town.

The specific objectives of the study are; to:

i. examine gender influence on the secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town;

ii. appraise difference in the secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town based on type of school;

iii. evaluate the age difference in the secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town;

iv. assess difference in the secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town based on subjects taught.

Research Questions

The following questions were answered in the study:

i. What is the perception of the secondary school teachers perceptions of STEAM delivery with learning management systems in Oyo town?

ii. Do the secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town differ by gender, type of school, age and subjects taught?

Hypotheses

The following hypotheses were tested at 0.05 level of significance:

Ho1: There is no significant perception of secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town;

Ho2: There is no significant gender difference of secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town;

Ho3: There is no significant difference of secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town based on school types;

Ho4: There is no significant age difference of secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town;

Ho5: There is no significant difference of secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town based on educational levels

Ho6: There is no significant difference of secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town based on subjects taught.

Ho7: There is no significant difference of secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town based on years of teaching experience.

Methodology

The research adopted the mixed method of qualitative and quantitative approach in concurrent triangulation. Qualitatively the sample of the study were interviewed, their responses were thematically

analysed to answer the research questions. Quantitatively, questionnaire was administered on the sample in a likert-scale type of descriptive survey design and the collated data were subjected to inferential statistics for hypotheses testing. All the secondary school teachers in Oyo town constituted the population of the study. A stratified sampled for the study (they were already exposed to flipped instruction in GSE 323, Science and Technology in Society). Altogether, there are 492 that responded to the questionnaire and the focused group interview. Two instruments; Secondary School Teachers' Perceptions of Enhancing Steam with Learning Management System Questionnaire **(SPESLQ)** and Secondary School Teachers' Perceptions of Enhancing Steam with Learning Management System Interview **(SPESLI)**. SPESLQ was a twenty-five item instrument adopted from Adesina and Bankole (2022) Perception of Flipped Pedagogy Scale. The 30-item instrument was a four- likert scale type with responses of Strongly Agree, Agree, Disagree, and Strongly Disagree, scored in 4,3,2,1 respectively for the positively worded items and vice-versa for the negative items. The SPESLQ was trial-tested at a secondary school at Akinyele local government area of the state, the collated data were subjected to Cronbach's Alpha reliability which yielded the value of 0.79. SPESLI was a self-constructed tool with 10 items. The tool was given to experts in Test and Measurement as well as those in psychometric, their critiques and comments enhance the face, content and construct validity of SPESLI. The scale was reduced to five items, the items were trial tested with individuals outside the scope of the study, their collated responses were subjected to inter-rater reliability of FleisKappa which yielded a value of 0.81. The researchers administered the validated instruments on the sample of the study, on the spot collection was made to ensure hundred percent retrieval. The collated interview was analysed thematically, the demographic variables of the respondents were represented in tables of frequency counts and percentages, mean and standard deviation were used to answer the research questions, t-test and analysis of variance (ANOVA) were used to test the set hypotheses at 0.05 level of significance.

Results

Table 1: Socio-demographic attributes of the Respondents

Variable	Frequency	Percentage (%)
Gender		
Male	166	69.2
Female	74	30.8
Total **School types** **Public** **Private** **Total**	**240** **124** **116** **240**	**100.0** **51.7** **48.3** **100.0**
Age Group		
20 – 29 yrs	38	15.8
30 – 39yrs	116	48.33
40-49 yrs	75	31.25
50yrs & above	11	4.58
Total **Levels of Education** **OND/NCE** **HND/ First Degree** **Masters Degree** **Total** **Subject taught** **Science** **Techbology** **Engineering** **Arts** **Mathematics** **Total**	**240** **28** **151** **59** **238** **90** **33** **6** **63** **42** **240**	**100.0** **11.8** **83.4** **24.8** **100.0** **38.1** **24.0** **2.5** **26.7** **17.8**

Years of Teaching Experience		
1-5 Yrs	**53**	**22.1**
6-10 Yrs	**92**	**38.3**
11-15 Yrs	**71**	**29.6**
16 yrs & above	**24**	**13.6**
Total	**240**	**100.0**

Table 1 revealed that there are 166 (69.2%) male, 74 (30.8%) female. 124 (51.7%) public, 116 (48.3%) private, 38 (15.8%) 20 – 29 years, 116 (48.33%) 30-39 years, 75 (31.25%) 40-49 years, 11 (4.58%) 50 years and above respondents. 28 (11.8%) OND/ NCE holders, 151 (63.4%), HND/ first degree and 59 (24.8%) masters holders. 90 (38.1%) science, 35 (24.0% technology), 6 (2.5%) engineering, 65 (26.7%) arts and 42 (17.8%) mathematics teachers in the distribution. Also, there are 53 (22.1%) 1-5 years teaching experience, 92 (38.3%) 6-10 years, 71 (29.6%) 11- 15 years, 24 (13.6 %) 16 years and above respondents in the distribution.

Answer to Research Questions

Research Questions 1: What is the perception of the secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town?

Table 1: Lecturers Perspectives of Enhancing Science Education With Learning Management Systems

S/N	ITEMS	SA (%)	A (%)	D (%)	SD (%)	Mean	Std. Deviation
1.	Learning management systems (LMS) are useful in enhancing STEAM.	104 (43.34)	28 (11.67)	81 (33.75)	27 (11.25)	3.02	0.68
2.	LMSs are available for STEAM.	97 (40.42)	41 (17.08)	63 (26.25)	49 (20.42)	3.02	0.68
3.	LMSs are good technological tools for STEAM teaching and learning.	96 (40.0)	43 (17.92)	72 (30.0)	29 (12.08)	3.34	. 0.52
4.	There are adaptable LMSs for STEAM teaching and learning.	110 (45.83)	35 (14.58)	68 (28.33)	27 (11.25)	3.41	0. 52
5.	LMSs are good for teaching and learning STEAM	97 (.40.42)	39 (16.25)	62 (25.83)	43 (17.92)	3.47	0. 57
6.	There is no LMS for STEAM teaching and learning.	23 (9.58)	38 (15.83)	142 (59.7)	37 (15.41)	2.63	0..90
7.	I am not aware of any LMS for STEAM.	45 (18.75)	49 (20.42)	133 (54.42)	13 (5.42)	2.77	1.33
8.	There is scarcity of LMSs In STEAM	37 (15.42)	53 (22.08)	133 (55.42)	17 (7.08)	2.36	0.93
9.	LMSs cannot aid both the teachers and learners of STEAM	15 (6.25)	71 (29.58)	104 (43.33)	38 (15.83)	2.64	0.83
10.	LMSs are efficient aid to teachers and Students of STEAM.	101 (42.08)	28 (22.67)	67 (27.92)	44 (18.33)	3.23	0.71
11.	LMSs are interactive tools for teachers and student of STEAM	105 (43.75)	47 (19.58)	54 (22.5)	34 (14.16)	3.45	0.60
12.	LMSs help student to engage effectively with contents of STEAM.	103 (.42.92)	31 (12.92)	77 (32.08)	29 (12.08)	3.36	0.54
13.	LMSs enhance students' adequate comprehension of STEAM	113 (47.08)	25 (10.42)	66 (27.5)	36 (15.0)	3.38	0.60
14.	LMSs empower the student adequate comprehension of STEAM	99 (41.25)	26 (10.83)	52 (21.67)	63 (26.25)	3.37	0.76
15	LMSs enrich the teaching – learning process in STEAM	94 (39.17)	41 (17.08)	57 (15.42)	48 (20.0)	3.37	0.64
16.	LMSs cannot enhance students'	38	43	57	112	2.85	0.88

	engagement in STEAM	(15.83)	(17.92)	(23.75)	(46.67)		
17.	LMSs cannot enable students' adequate comprehension of STEAM	24 (10.0)	18 (7.5)	59 (16,25)	139 (57.92)	2.98	0.91
18.	LMSs cannot serve as interactive tool for lectures and students in STEAM	34 (14.17)	43 (17.92)	23 (9.58)	140 (58.33)	3.04	0.88
19.	LMSs cannot empower the student to learn STEAM at their own pace.	13 (5.42)	18 (7.5)	59 (24.58)	140 (58.33)	2.98	0.92
20.	LMSs cannot enrich the teaching and learning process in STEAM	1 (0.42)	7 (2.92)	86 (35.83)	126 (52.5)	3.01	0.74
21.	I can accept LMSs for teaching and learning of my STEAM	92 (38.33)	63 (26.25	33 (13.75)	52 (21.67)	3.10	0.63
22.	I will like to adapt LMSs in my STEAM study.	107 (44.58)	54 (22.5)	63 (26.25)	16 (6.67)	3.37	0.55
23.	LMSs will be useful in my STEAM study.	96 (40.0)	67 (27.92)	36 (15.0)	41 (17.03)	3.42	0.64
24.	I cannot accept LMSs for teaching and learning of STEAM	23 (9.58)	38 (15.83)	46 (19.17)	133 (55.42)	2.95	0.86
25.	It is a waste of time using LMSs in STEAM for interaction with students.	22 (9.17)	17 (7.08)	45 (18.75)	156 (65.0)	3.15	0.91
	Weighted mean: 3.17						

From Table 1, majority of the respondents 132 (55.01%) agreed that Learning Management Systems (LMS) are useful in enhancing STEAM while a comparatively low minority 108 (45.99%) disagreed with the assertion with a 3.02 and 0.68 mean and standard deviation scores. 150 (62.5%) of the respondents disagreed that there is scarcity of LMSs on STEAM whereas on 90 (37.5%) agreed with the assertion with a 2.36 and 0.93 mean and standard deviation scores. 152 (63.33%) of the respondents agreed that LMSs are interactive tools for lectures and student of STEAM while 88 (36.67%) disagreed with the assertion. Relatively high number 150 (64.58%) of the respondents agreed that they can accept LMSs for teaching and learning of STEAM whereas a smaller percentage 90 (35.42 %) of the respondents disagreed with the assertion. 163 (67.92%) of the respondents agreed with the statement that LMSs will be useful in STEAM whereas a minority of 77 (32.08%) disagreed with the assertion. The overall mean score of 3.17 revealed that the secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town is above average score.

The qualitative data revealed that majority of the respondents had been using LMSs prior to the administration of the instruments. only very few have not heard and utilized the LMSs in their teaching tasks. After the research assistants had briefed the respondents about the LMSs software, its interphases for synchronous and asynchronous interactions, interphases for games, embedded videos, availability of online assignment and technology based test, Immediate Knowledge of Results (IKOR), majority of the interviewed respondents acceded to imbibe the technological software to blend their classroom interaction.

Research Question 2: Do the secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town differ by gender, type of school, age, levels of eduction, subjects taught nd years of teaching experience?

The male nd female respondents, the public nd private teachers with different ages, levels of education and different types of subject taught have similar perception of STEAM delivery with learning management systems in Oyo town when interviewed

Hypotheses Testing

Ho1: "There is no significant perception of secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town"

Table 2: T-test Analysis of secondary school teachers' perceptions of STEAM delivery with learning management systems

Variable	N	Mean	SD	Df	t	Sig	Remarks
Secondary school teachers 'perceptions	240	72.28	7.87	239	137.12	.000	*S

Table 2 indicates that there is a significant secondary school teachers' perceptions of STEAM delivery with learning management systems LMS (N=240, Mean= 72.28, df-239, t=137.12, p<.05). Therefore, the null hypothesis was not accepted.

Ho2: "There is no significant gender difference of secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town"

Table 3: T-test Analysis of Secondary School Teachers' perceptions of enhancing STEAM with LMS based on Gender

Teachers' perceptions of LMSs	N	Mean	SD	Df	T	Sig.	Remarks
Male	166	74.07	7.68	238	-2.93	.071	NS
Female	74	75.60	7.48				

From Table 3, there is no significant difference in secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town (N=240, df-238, t=-2.93, p.05). Therefore, the null hypothesis was accepted.

Ho3: "There is no significant difference of secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town based on school types"

Table 4: T-test Analysis of Secondary School Teachers' perceptions of enhancing STEAM with LMS based on School Types

Teachers' perceptions of LMSs	N	Mean	SD	Df	T	Sig.	Remarks
Public	124	72.55	7.918	238	0.491	.058	NS
Private	116	72.03	7.854				

Table 3 reveled that there is no significant difference in secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town based on school types (N=240, df-238, t=0.491, p.05). Therefore, the null hypothesis was accepted.

Ho4: "There is no significant age difference of secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town"

Table 5: Analysis of Variance of secondary school teachers' perceptions of STEAM delivery with learning management systems based on age difference

1	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	24.147	3	8.049	0.138	.943
Within Groups	13735.906	236	58.199		
Total	13760.054	239			

Table 5 indicates that the Analysis of Variance of secondary school teachers' perceptions of STEAM delivery with learning management systems based on age difference is not significant ($F_{(3, 236)}$ =0.138, p<.05). Therefore, the null hypothesis was accepted.

Ho5: There is no significant difference of secondary school teachers' perceptions of STEAM delivery

with learning management systems in Oyo town based on educational levels

Table 6: Analysis of Variance of secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town based on educational levels.

1	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	341.649	2	170.825	0.368	.062
Within Groups	113207.591	237	477.669		
Total	113549.240	239			

Table 6 indicates that the Analysis of Variance of secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town based on educational levels is not significant ($F_{(2, 237)} = 0.368$, $p < .05$). Therefore, the null hypothesis was accepted.

Ho6: There is no significant difference of secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town based on subjects taught.

Table 7: Analysis of Variance of secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town based on subjects taught.

1	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	297.971	5	59.594	1.043	.477
Within Groups	13373.279	234	57.151		
Total	13760.054	239			

Table 7 indicates that the Analysis of Variance of secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town based on subjects taught is not significant ($F_{(5, 234)} = 1.043$, $p < .05$). Therefore, the null hypothesis was accepted.

Ho7: 'There is no significant difference of secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town based on years of teaching experience.'

Table 8: Analysis of Variance of secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town based on years of teaching experience

1	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	109.610	3	36.537	0.632	.625
Within Groups	13650.444	236	57.841		
Total	13760.054	239			

From Table 8, it was reveled that the Analysis of Variance of secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town based on years of teaching experience is not significant ($F_{(3, 236)} = 0.632$, $p < .05$). Therefore, the null hypothesis was accepted.

Discussion

The results indicate that the secondary school teachers have very high perceptions of STEAM delivery with learning management systems, LMSs. This was due to their personal experience in the panic remote learning during the COVID-19 pandemic. Many of the secondary school teachers both the male nd the female, the public s well s the private schools teachers have high perceptions of STEAM delivery with LMSs. The teachers' conversant use of the social media like facebook, wattsapp might have influence their positive, high perceptions of STEAM delivery with LMSs. This result find support in Kant, Prasad and` Anjali (2021) that techers held high perspectives of lesson delivery with LMSs, also with Holmes and Prieto-Rodriguez (2018) that both students and teachers hold high perceptions of enhancing science with LMSs. The results also find support in James and Courage (2024), Salas-rueda and Alvarado-zamorano (2024) that teachers' perceptions of LMS use during COVID-19, and after showed LMS positively impacted learning, motivation, and student participation.

From the qualitative and quantitative results, it was indicated that the secondary school teachers high perceptions of STEAM delivery with learning management systems was not beclouded by their socio-demographic variables of gender, school types, age, educational qualification, types of subjects taught and their years of teaching experience. This is explained on the trending effect of technology in form of LMSs in revolutionizing lesson delivery. It equally justifies the ubiquitous of technology in lesson delivery in accordance to the National Science Teaching Association in America that recommends the Next Generation Science Standard, NGSS of teaching and learning science and science related subjects like technology, engineering, arts and mathematics with technology and reflective thinking. This finding is contrast to the submission of Odekeye et al. (2023) that found a significant difference in undergraduate students' perception of the use of LMS in instructional delivery based on gender, class levels and area of speciliasation.

Conclusion

Exactly, the study centered on secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town, from the empirical findings of both the qualitative and the qualitative data analyses, it could be concluded that the secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town is high and positive. Moreover, the secondary school teachers' perceptions of STEAM delivery with learning management systems in Oyo town was so high that gender, school types, age, educational qualification, types of subjects taught and their years of teaching experience could not becloud it.

Recommendations

From the findings of the study, the following are therefore recommended:

i. The Teaching service Commission should organize seminars, symposi*a*, workshops, and conferences on effective learning management systems to enhance prompt awareness of massive open educational software and LMSs to the secondary school teachers so as to intimate them with the vast opportunities in STEAM delivery with technological software;

ii. Government should provide technological infrastructures in secondary schools to enhance STEAM delivery with learning management systems in Oyo town.

iii. secondary school teachers should utilize the novel and emerging technologies in order to enable, enhance, enrich and empower the STEAM instructional delivery effectiveness.

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