

A novel instructional approach: the effect of computer-assisted simulation learning games (CASLGs) on social studies students' scholarly learning outcomes

Students'
scholarly
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outcomes

235

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Abstract

Purpose – The purpose of the article is (1) to find out whether students instructed with Computer-Assisted Simulation Learning Games (CASLGs) will improve in their scholarly learning outcomes and (2) to ascertain if the biological construct of sex will affect students' scholarly learning outcomes.

Design/methodology/approach – The study was experimental. The study sample comprised 120 students from four schools. The study instrument was the Scholarly Learning Outcomes Test (SLOT), drawn from the school syllabus. The study lasted six weeks. Before the experimentation, the students were pre-tested using the Scholarly Learning Outcomes Test (SLOT). After which, students were posttested to ascertain students' scholarly learning outcomes. The statistical mean was employed to analyse data generated from the pretest and posttest to provide answers for the research questions, while analysis of covariance (ANCOVA) statistics was utilised to test the hypotheses.

Findings – The results show that CASLGs improved students' scholarly learning outcomes more than the face-to-face instructional approach and the biological construct of sex is of no effect on students' scholarly learning outcomes.

Research limitations/implications – First, in performing the study, the regular instructors/teachers were utilized. The personalities of these instructors were not considered or scrutinized; this might have impacted the research outcomes.

Implications for future studies: One advantage is that it is part of a bigger initiative in which there are extra sources of data to study. This information or data from this study would help to throw further light on the predictors of student scholarly learning outcomes in the near future. One implication of this study rests on the confirmation that activity-based strategies such as CASLGs enhance students' scholarly learning outcomes.

Originality/value – This study is a product of the author's doctoral thesis. It is the outcome of the investigation carried out by the author for the award of PhD; therefore, it is original. The study's results are of immense value because they contributed to knowledge in the area of computer-based learning games.

Keywords Novel instructional approach, Computer-assisted simulation learning games, Simulation learning games, Social studies, Social studies students', Scholarly learning outcomes

Paper type Research paper

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Introduction

Conventionally, teachers utilise a teacher-to-student direct approach, but with technological advancements, such as the application of computers, the Internet, visual applications, social networks and video technology, it is necessary for teachers to apply novel instructional approaches to instruction. The end product or output of instructions is to improve students' scholarly learning outcomes.

As a scholarly discipline/subject in Nigerian schools, Social Studies is a subject in which the concept of society has been infused. However, despite its significance to vocational and allied disciplines, it is plagued with numerous problems, such as unsatisfying students' scholarly learning outcomes (Obro, Ogheneakoke, & Akpochafo, 2021). This ugly trend could be ascribed to several factors, which include the abstract nature of the subject (social studies), lack of relevant and current teaching resources, ineffective teaching methods and dwindling interest in Social Studies (Okam & Onuoha, 2011).

Computer-Assisted Simulation Learning games (CASLGs) are tools and teaching approaches that facilitate teaching as well as learning through practice and illustration in a repeatable-driven atmosphere (Gruss, 2016). CASLGs could be used in Social Studies learning through the provision of real-life conditions for classroom learning and instructions. It is an instructional method that is student-centred (Adoke, 2015). Other factors associated with students' unsatisfactory scholarly learning outcomes in upper basic Social Studies classes include the shortage of qualified graduate teachers, the inability of parents and guardians to provide their wards with essential learning materials and inadequate time for the subject on the school timetable, among others. In many schools, Social Studies is allocated just a period per week, which is grossly inadequate. Sometimes, school administrators draft Social Studies teachers to teach other subjects at the expense of the subject. The outcome is that only a few topics on the scheme of work are covered at the end of the term, resulting in unsatisfactory students' learning outcomes (Obro *et al.*, 2021). The lukewarm attitude of society towards Social Studies, just like pure sciences, affected the subjects.

The issue of the effect of biological construct (sex) on students has been inconclusive. Studies have shown that males enhance their scholarly learning outcomes when measured with their female counterparts. However, some reviewed in their studies that female students improved in their learning outcomes more than males. In comparison, others discovered no difference in male and female students' scholarly learning outcomes.

Sex refers to the features of males and females, men and women, that are biologically constructed. It is the preferred term or word for biological forms. It thus connotes a set of biological features or attributes. In this vein, Okeke (2008) affirms that women grapple with a lot of discrimination and difficulties. This study thus explored the effects of CASLGs on students' scholarly learning outcomes in Basic Social Studies.

Simulation

Ogheneakoke, Obro, and Benike (2019) stated that simulation is one of the problem-solving learning and teaching activities/methods. Simulations replicate real societal issues and problems and their networks of related variables. These issues and all other factors that affect them are modelled in simulation class execution (Sulaiman, Ibi, & Bukar, 2016). The majority of simulation models are developed around a single problem, and individuals or groups are assigned aspects of the problem to explore or study. The classroom simulation is finally executed. The problems or issues at hand are presented as real, and the interplay of different factors is likewise presented in the execution of a classroom simulation. The students are then made to ruminate on the problems/issues in their entirety or wholeness and advance a workable solution to them (Vlachopoulos & Makri, 2017).

Concept of games

Games are sometimes used in error to mean simulation. Some scholars merge the two words or concepts to have simulation game. A game is a structured exercise that requires and rewards the use of specific abilities or skills. Each participant strives to outshine others in the demonstration of skills and abilities and, consequently, in the total points as the game progresses. There are winners and losers at the close of games (Al-Zaytoonah, 2016). Some games are developed to teach or exercise certain cognitive or social behaviour skills, knowledge and competencies, which are of educational importance (Adoke, 2015). For example, the snake and ladder, monopoly, etc., games have been developed to promote educational significance. As a game is played severally, the students master the concepts the game is meant to depict (Obro *et al.*, 2021).

Recent studies

In general, research on the utilisation of CASLGs in Social Studies focuses more on the influence of the usage of digital games on learning outcomes. There is currently a paucity of research comparing the usefulness of using CASLGs to enhance students' scholarly learning outcomes. The empirical findings involving the effectiveness of CASLGs may be used as evidence that CASLGs can or otherwise be an alternate solution to the decline in students' scholarly learning outcomes. In addition, the use of CASLGs is strongly associated with competitiveness. The greater the number of players in a game, the more cheerful and competitive the environment becomes. Each participant will be driven to work as effectively as possible with the offered obstacles. In the context of education, the usefulness of the utilisation of CASLGs in relation to students' scholarly learning outcomes raises a significant issue.

Pajarillo-Aquino (2019) examined the effect of online simulation games on students' scholarly learning outcomes. The researchers used a descriptive-correlational research design. This study design described the respondents' profiles and ascertained the difference between online computer-assisted simulation games in non-players and players' scholarly learning outcomes. The study concluded that students playing online simulation games did not differ in their scholarly learning outcomes because the students still did well in their classes, as shown by what they learned. In a study by Serrano (2019) on CASLGs on student skill development, it was reported that the games were marginally beneficial for teaching mathematics to PreK–12 kids. Tokac, Novak, and Thompson (2019) looked at the effect of learning video simulation learning games on PreK–12th grade students' scholarly learning outcomes in mathematics. Results from the study demonstrated that video simulation learning games showed slightly greater usefulness for teaching mathematics students across PreK–12th grades.

Gambari, Shittu, Falode, and Adegunna (2016) investigated computer self-interactive package (CSIP)'s effectiveness on students' scholarly learning outcomes among second-year students instructed with CSIP. It was a quasi-experimental study involving 92 students. Results indicated improved students' scholarly learning outcomes in CSIP groups in comparison to non-CISP groups. Julius, Twoli, and Maundu (2018) examined the effects of CASLGs on the scholarly learning outcomes of chemistry students' compared to traditional ways of teaching. This involves 174 chemistry students from four high schools chosen on purpose. The study established that CASLGs enhanced or boosted students' scholarly learning outcomes in comparison to the traditional ways of teaching. The CASLG group improved their scores compared to the students of the traditional ways of teaching. Ode (2018) explored the effect of computer-assisted simulation teaching games on the scholarly learning outcomes of students in government as a subject. The data collection instrument was a 25 item teacher-made test. The study sampled 100 senior secondary students, which

were divided into two groups – the treatment/experimental group and the control group. Each group was instructed for eight weeks using computer-assisted simulation instruction programmed packages for the treatment/experimental group and a conventional instruction method for the control group. The study indicated that students instructed using computer-assisted simulation instruction significantly improved their scholarly learning outcomes compared to students instructed using conventional instruction methods.

Saprudin, Liliyasi, Prihatmanto, and Setiawan (2019) compared the effects of digital simulation learning games on students' scholarly progress in small vs big courses with 58 preservice physics instructors divided into two courses, a small class and a big class. Both classes explore the physics of light with the same digital simulation learning gaming program. A paper-and-pencil examination comprised of multiple-choice questions was used to gather data. The findings indicated that the adoption of a digital simulation learning game enhanced students' scholarly learning outcomes. There was a favourable correlation between the growth in academic accomplishment and the improvement in gaming scores. Yeşilbağ, Korkmaz, and Çakir (2020) examined instructional computer simulation learning games' impact on the scholarly learning outcomes of students in the tenth grade. A total of 60 tenth graders participated in the study. A learning outcome test was administered as a pre- and post-test on the students. The study discovered that the experimental group did better than the control group. The findings imply that computer simulation learning games may be employed in education as an information communication technology (ICT) tool to improve students' English learning outcomes. Islam, Biswas, and Khanam (2020) investigated electronic gaming with scholarly learning outcomes in Australian children. A total of 1704 11–17-year old children were the study sample. A national cross-sectional study employing generalized linear regression models with survey weighting adjustments was used to analyse collected data. The study demonstrated that electronic simulation gamers got higher reading scores over the week than those who did not play electronic simulation games.

Ukwetang, Nja, Eneyo, Ambe, and Eita (2021) researched to ascertain the effect of ICT-simulated learning games on students' scholarly learning outcomes in tourism in Calabar Municipality. The study was a survey study that involves 200 sampled students. A performance test and a four-point rating scale questionnaire served as the data gathering instruments. The hypotheses generated were tested using an independent student test. The result established that a significant difference did exist between the scholarly learning outcomes of students instructed with and without ICT-simulated learning games. Effiong, Ekpo-Eloma, Ekpo, Jacob, and Udoh (2022) assessed the effectiveness of smart slate simulation learning games on the scholarly learning outcomes of second year students in Educational Technology. The study was quasi-experimental that utilised a pre- and post-test control group design. Using a purposive sampling method, 131 students were selected for the study: 66 in experimental group and 65 in control group. The Educational Technology Performance Test (ETPT) served as the data gathering tool. Data were examined using analysis of covariance (ANCOVA). The study established that students instructed with the smart slate simulation learning game improved their scholarly learning outcomes. It was, thus, suggested that smart slate simulation learning games should always be utilized to improve students' scholarly learning outcomes and that instructors should construct their lesson plans using smart slate simulation learning games to encourage group work and enjoyment while learning.

However, many studies found no effect of CASLGs on students' scholarly learning outcomes (Obro & Enayemo, 2022). Some researchers demonstrated that students did not differ in performance in the utilisation of CASLGs. Abdulmajed, Park, and Tekian (2015) reported negative effects such as strain as a result of aggressiveness, space, repetitive motion, funding, hitting and time. Learning games in the report of Gleason (2015) were found not to

always improve students' scholarly learning outcomes. The study demonstrated that students showed no improvement in scholarly learning outcomes when instructed with CASLGs. Hadi (2017) explored the effectiveness of video-simulated learning games on learners' English vocabulary. The study involves 60 learners as a sample. The study found that instructional video learning games did not improve learners' English vocabulary.

As a component of educational instructional approach usage, CASLGs may serve as learning aids, motivators and curiosity generators, hence optimizing student learning outcomes in everyday educational practice. Multiple independent research studies conducted over the years have demonstrated the favourable effect of CASLGs on students' scholarly learning outcomes. Thus, it is expected that CASLGs are employed or utilised at many educational levels to teach varied learning objectives. Even though there have been a lot of studies on how CASLGs get students motivated and enhance their scholarly learning outcomes, they are still not very common in basic schools. This study emphasizes that the bulk of these problems seem to arise from implementation challenges with classroom games, and there is barely any agreement as regards the effectiveness of CASLGs because of inconsistency in research findings. The inconsistencies in research findings and the need to devise a novel instructional approach to enhance students' scholarly learning outcomes are the bane of this study and the gaps in the extant literature.

Research questions

RQ1. Will students instructed with CASLGs improve their scholarly learning outcomes?

RQ2. Will the biological construct of sex affect students' scholarly learning outcomes?

Hypotheses

H1. CASLG will not improve students' scholarly learning outcomes in Social Studies.

H2. The biological construct of sex will not affect students' scholarly learning outcomes in Social Studies.

Methods

The study was experimental, involving the use of CASLGs as an experimental group and the traditional face-to-face method as the control group. The population of the study comprised 3,637 Basic 9 students drawn from 20 urban and rural settings/areas of the local government area and both sexes.

The study sample comprised 120 students who constituted 3.3% of the total population drawn from four (4) selected schools using the multistage sampling procedure through the balloting method at three (3) levels: first level-selection of four constituencies, second level-selection of a school from each of the four (4) constituencies and third level-selection of four (4) intact classes from each of the schools. The study sample is of similar demographic features or characteristics to the study population. Thus, they possess the same homogeneous features since they are of the same region, cultural background, class, school curriculum and syllabus. A sample size of 3.3% was chosen because the study was experimental. The four schools used were far enough from one another, and no school was given double treatment not to allow interference. Thus, the topics for the experiment were not taught to any school

before the start of the experiment. The arm that was used for the study was selected through a dice.

The study instrument was the Scholarly Learning Outcomes Test (SLOT). The SLOT is a two- (2) tier instrument made up of two (2) sections. Section A comprises questions on students' bio-data, while section B contains comprises 25 multiple-choice questions of one correct or right answer with four (4) wrong answers. The item content was from the school syllabus and was carefully selected from previous Basic Education Certificate Examination and modified by the researcher. These items were of the Basic 9 Social Studies content/ syllabus. The SLOT covered the topics of transportation, values and savings. The SLOT was constructed using a test blueprint. The reliability value or index was found to be 0.79 using the Cronbach alpha statistics.

The group of students (120) were exposed to CASLGs and face-to-face instructional method for 6 weeks, studying transportation, values and savings. Prior to the experimentation, the students were pretested using the SLOT. After that, they were taught the topics using the CASLGs and the face-to-face instructional methods and given a post-test after the six-week experimentation to ascertain students' scholarly learning outcomes. The statistical mean was employed to analyse data generated from the pretest and posttest to provide answers for the research questions, while students' test statistics was utilised to test the hypotheses.

Results

RQ1 Will students instructed with CASLGs improve their scholarly learning outcomes? Table 1 shows that students instructed with CASLGs had a mean of 55.66 in the pretest and 78.18 in the posttest, bringing to 22.52 as mean gain. This demonstrated that students who were instructed or exposed to CASLGs improved in the posttest scholarly learning outcomes compared to their pretest (see Figure 1).

Hypothesis 1 CASLGs will not improve students' scholarly learning outcomes in Social Studies. Table 2 shows the students'-test of the mean difference between the CASLGs and face-to-face instructional method scores as measured by the SLOT. The mean difference between the CASLGs ($M = 78.18, SD = 14.71$) and face-to-face instructional method ($M = 66.76, SD = 13.89$), conditions; $t(118) = 3.95, p = 0.01$, observed in Table 2 was significant. This result suggests that CASLGs do affect students' scholarly learning outcomes. Since $p = 0.001$ is less than 0.05, the hypothesis of no significant effect of CASLGs on students' scholarly learning outcomes is rejected. Thus, CASLGs significantly improve students' scholarly learning outcomes. Specifically, the results suggest that when students are instructed using the CASLGs, their scholarly learning outcomes increases.

RQ2 Will the biological construct of sex affect students' scholarly learning outcomes? Table 3 indicates that male students had a scholarly learning outcome mean of 66.72 in the pretest and 85.50 in the posttest, with a scholarly learning outcome mean gain of 18.78. Female students had a scholarly learning outcome mean of 68.81 in the pretest and 82.70 in the posttest resulting in a mean gain of 13.89. Therefore, this result demonstrates that at posttest, male students improve in their scholarly learning outcomes with mean scores of 85.50 higher than female scholarly learning outcomes mean scores (82.70). This implies that

Table 1.
Pretest and posttest scores of students instructed with CASLGs

Experiment	Pretest			Post-test			Mean gain
	N	\bar{X}	SD	N	\bar{X}	SD	
Computer-assisted simulation learning games (CASLGs)	60	55.66	11.41	60	78.18	14.71	22.52

male students improved in their scholarly learning outcomes in comparison with their female counterparts (see Figure 2).

Hypothesis 2 The biological construct of sex will not statistically affect students' scholarly learning outcomes in Social Studies. Table 4 shows the students' test of the mean difference between males and females in the CASLGs group as measured by the SLOT. The mean difference between the male ($M = 85.50$, $SD = 12.78$) and female ($M = 82.70$, $SD = 11.94$) conditions, $t(58) = 0.87$, $p = 0.39$ observed in Table 4 was not significant. This result suggests that students' biological construct of sex does not affect students' scholarly learning outcomes. Since $p = 0.39$ is greater than 0.05, the hypothesis of no significant effect of the biological construct of sex on students' scholarly learning outcomes is, therefore, accepted. Thus, whether male or female, students do not affect students' scholarly learning outcomes. Specifically, the results suggest that both male and female students did not perform differently scholarly. The hypothesis was thus accepted, and a decision of no effect was reached.

Discussion

The results of hypothesis one show that CASLGs improved students' scholarly learning outcomes more than the face-to-face instructional approach. This implies that students exposed to CASLGs improved more than those instructed with the face-to-face teaching approach. This suggests that CASLGs are effective and increase students' scholarly learning outcomes. This result collaborates with that of Ahmad, Fauzi, Hashim, and Zainon (2013), Ogosi (2015), Beuk (2015), Al-Zaytoonah (2016), Dankbaar et al. (2016), Sulaiman, Ibi and Bukar (2016) and Obro and Enayemo (2022) who reported that CASLGs improved students' scholarly learning outcomes significantly. Furthermore, the study results confirmed that Iwuanyanwu (2016), Fatokun, Egya, and Uzoechi (2016), Vlachopoulos and Makri (2017) and Kornak-Bozza (2017), who in their studies revealed improved learning outcomes for students

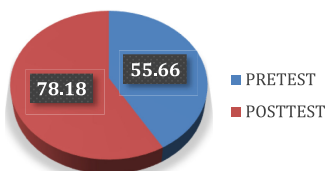


Figure 1. Students' pretest and posttest scores in CASLGs

Groups	N	Mean	Mean difference	Std. dev.	df	t_{cal}	Sig (2 tailed)
Computer-assisted simulation learning games (CASLGs)	60	78.18	11.42	14.71	118	3.95	0.01
Face-to-face method	60	66.76		13.89			

Table 2. Summary of students' test statistics showing the mean difference between CASLGs and face-to-face instructional method

Groups	Pretest			Posttest			Mean gain	
	Gender	N	\bar{X}	SD	N	\bar{X}		SD
Computer-assisted simulation learning games (CASLGs)	Male	25	66.72	17.13	25	85.50	12.78	18.78
	Female	35	68.81	12.66	35	82.70	11.94	13.89

Table 3. Pretest and posttest scores based on sex

taught using CASLGs. This result might be because CASLGs is an activity and problem-solving-oriented teaching approach. Therefore, classroom activity founded on CASLGs results in decreased rote learning and increased learning. This is because it makes sure that students who take part in classroom activities at every stage and time of learning use their time and effort wisely.

Hypothesis two demonstrated that the biological construct of sex does not affect students' scholarly learning outcomes. This result is in line with that of Okonkwo (2012), Al-Zaytoonah (2016) and Ogheneakoke *et al.* (2019), who reported that sex has no significant effect on students' scholarly learning outcomes. This result, however, is at variance with Atovigba, Vershima, O'kwu, and Ijenkeli (2012), Buabeng, Ampiah, and Nelson (2012), Rizi, Nujafipour, Haghani, and Dengban (2013) and Kholoud (2016), who all conveyed a significant effect of the biological construct of sex on students' scholarly learning outcomes. Furthermore, male and female students' scholarly learning outcomes were equally boosted or increased. The result can be attributed to the fact that CASLGs are not restricted to sex.

Conclusion

This study provided empirical evidence that CASLGs improved students' scholarly learning outcomes compared to the face-to-face instructional approach. It was concluded that if Social Studies instructors utilise CASLGs, the scholarly learning outcomes of students will improve. Therefore, instead of limiting students to the face-to-face instructional approach, novel instructional approaches such as CASLGs should be applied or utilised because they would boost students' scholarly learning outcomes. CASLG, when encompassed, would increase and boost the scholarly learning outcomes of students.

The use of CASLGs for instruction in Social Studies enhanced the scholarly learning outcomes of the students irrespective of their biological construct of sex.

Limitations of the study

This research has some limitations. First, in performing the study, the regular instructors/teachers were utilized. The personalities of these instructors were not considered or scrutinized; this might have impacted the research outcomes. It must be documented that this

Pretest and Post-test Scores of Based on Sex.

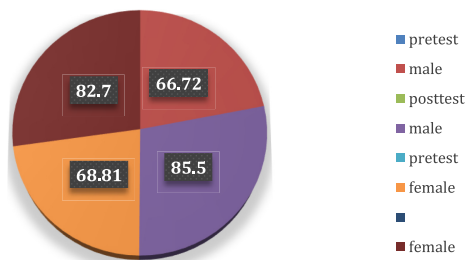


Figure 2. Male and female students' pretest and posttest scores in CASLGs

Table 4. Summary of students' test statistics showing the mean difference in students' biological construct of sex scores

Sex	N	Mean	Mean difference	Std. dev.	df	t _{cal}	Sig (2 tailed)
Male	25	85.50	2.8	12.78	58	0.87	0.39
Female	35	82.70		11.94			

study was done using a limited sample of 120 students. These may not allow for a wider generalization of the results of this research.

The topic/content taught was also confined to what is stipulated in the curriculum only to guarantee that nothing interrupted the smooth operation of the co-operating schools. It is expected that the use of additional topics and units of instruction would provide for a greater generalization of the findings of this study.

Implications for future studies

This study has brought valuable, although in many ways, limited knowledge. One advantage is that it is part of a bigger initiative in which there are extra sources of data to study. This information or data from this study would help to throw further light on the predictors of student scholarly learning outcomes in the near future. In other words, it may help to uncover what stimulates certain students to learn and improve their learning outcomes.

One obvious implication of this study rests on the confirmation that activity-based strategies such as CASLGs enhance students' scholarly learning outcomes. Social studies instructors are encouraged to apply it in teaching. It is a fact that this novel instructional approach to teaching is challenging for teachers but improves learning outcomes. It goes further to suggest that involving learners in carefully structured activities where the learners play the most active part and interact with each other to construct their knowledge will help in achieving meaningful learning that is retained. This has implications for curriculum planners, who should carefully appraise the curriculum content and implementation strategies and ensure that adequate provision is made for the use of these innovative, activity-based approaches. There is a need, therefore, for a paradigm shift from mere paperwork to the actual business of implementation by these curriculum planners.

Findings from the study have implications for students. Students have the responsibility of ensuring that they learn meaningfully and function adequately in their environment and world, but also to enable them to be gainfully employed. Since results from the present study indicate that students' scholarly learning outcomes are boosted through CASLGs, it follows that students have a greater responsibility toward their learning. Thus, CASLGs should be integrated into the school curriculum.

The study's findings have implications for examining bodies as well. The procedure for implementing novel instructional approaches requires more time to be effective and for greater student participation in the learning process. Examining bodies should therefore play down the current emphasis on content coverage, which places a lot of constraints on both teachers and students to use methods that will enable them to cover the syllabus within the specified time.

Recommendations

- (1) Educators should make sure to participate in assessing and evaluating online educational materials for use in classroom instruction.
- (2) Novel instructional approaches to instruction should be integrated into the curriculum of instructor training institutions.
- (3) Arrangements and provisions should be made for all Social Studies instructors to participate in the professional development of CASLG and other computer-assisted instruction for schools.
- (4) CASLGs should be applied in Social Studies instruction and learning irrespective of students' biological construct of sex.

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Further reading

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