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Using Games in Teaching Integrated Science: The Perceptions and Readiness of Teachers

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Abstract. The use of appropriate pedagogy for teaching and learning is very essential for the success of every lesson. Games have been established to be one of the effective methods in teaching and learning at the basic level of education. This study was conducted to find out the perceptions and readiness of integrated science teachers on the use of games in teaching and learning. The investigation targeted the population of the public Junior High School teachers in integrated science at Akyem Oda, the capital of Birim Central Municipal in the Eastern region of Ghana. Thirty-two (32) teachers were assembled through simple random sampling from eleven (11) schools for the study. Questionnaire was used for data collection. Data was analysed descriptively. The findings revealed among the integrated science teachers who previously have used games in teaching and learning as an effective method. However, there was generally a higher negative perception on the use of games in teaching integrated science. Teachers were more inclined to the use of demonstration method in teaching the subject than all other methods. Nonetheless, teachers wish to use games in teaching the subject in the future. There was also a negative correlation between the desire to use games in teaching and learning of integrated science and age of teachers. The findings should guide stakeholders to help strengthen the knowledge base of integrated science teachers in games as its benefits are enormous in teaching and learning.

Keywords: Games, Teachers, Integrated Science, perceptions

INTRODUCTION

Education, whether formal, informal or non-formal is designed to cause expected changes in the cognitive, affective and the psychomotor domains of an individual. Its structures are deliberately weaved to meet the pattern of growth, development and needs of a society, usually at a point in time (Ministry of Education, 2018).

The fundamentals for development and advancement in the world and thus in every country largely hinges on science and technology (Ministry of Education, 2019). It is beneficial, therefore, to every individual to at least acquire some basic general scientific literacy to function effectively and be fit into the current scientific world. It is for this reason that Ghana has chosen the goal "science for all" (Ministry of Education, 2010) and has made the study of science a core subject (mandatory) from the basic level to second cycle to help drive this agenda. In Ghana, science as a subject at the basic school levels is

taught in integration. The curriculum consists of topics from biology, physics, chemistry, and agriculture science (Ministry of Education, 2019).

Despite the deliberate effort to achieve the above goal, there are numerous challenges hindering the smooth implementation of this at basic school levels (especially Primary and Junior High Schools) in Ghana. Quality teaching and learning is one of the pillars for imparting scientific concepts in learners (Quansah et al., 2019). Science teachers must provide and ensure quality facilitation (Ministry of Education, 2019) to achieve this. It is, however, unfortunate that methods used by teachers in teaching science has been listed as one of the challenges in science education at the basic levels (Anamuah-Mensah et al., 2017; Fredua-Kwarteng & Ahia, 2005; Ngman-wara 2015; Parker, 2004; Hill et al., 2005). Lecture method which is largely teacher-centered, and imposition of knowledge from the teacher and textbooks on learners has been reported to be the most used in teaching integrated science (Tufail and Mahmood, 2020). This method, like all other teacher-centered methods gives the instructor the convenience in teaching than the learner-centered methods that aid understanding and minimize memorization among learners (The Organization for Economic Co-operation and Development, 2006).

Games as method of teaching has been recommended as one of the effective and child-centered approaches in teaching learners at the basic level (Orim and Ekwueme, 2011; Ziekah, 2014; Yeboah et al., 2023). The following reasons have been assigned to this;

a. Games are used as ice breakers to introduce new concepts, for the consolidation of ideas, for removing drudgery from drill and for creating a positive and enthusiastic atmosphere in classrooms (Orim and Ekwueme, 2011).

b. Games involve well-structured teaching activities with set rules which allow learners to interact with each other and learning resources to reach instructional objectives (Harbor-Peters, 2001).

c. Games help to increase learners' motivation, engagement, and observation skills. It improves collaboration and interaction among learners and enhance their ability to practically apply knowledge gained in teaching and learning in the real world (Hardman & Ntlhoi, 2021; Zirawaga et al., 2017).

All the above support the principles underpinning the implementation of the new science curriculum for basic schools which promotes the use of pedagogies that allow every learner to participate fully in every learning process and enjoy learning (Ministry of Education, 2019). Furthermore, Yeng (2019) reported that games enhance the understanding and output of learners in teaching and learning of science which would result in developing critical thinking and problem-solving skills in the them. However, report on the use of games in teaching integrated science at the Junior High School level in Ghana seem non-existing at time of the study. It is against this background that the study was setup to investigate the perceptions and readiness of integrated science teachers at the public Junior High Schools in Akyem Oda, the capital of the Birim Central Municipality in the Eastern Region of Ghana.

LITERATURE REVIEW

The Impact of Games on the Performance of Learners

The inadequate reliability of the conventional teaching methods in achieving quality education has led to the introduction of several learning models of which incorporating games in the lesson delivery has become a preferred method of choice. Game-based learning in education is mostly perceived as time-consuming method which renders the pupils not serious with learning processes and more so teachers not able to complete their lesson plans. That notwithstanding, if these games are appropriately designed and directed towards delivering curriculum concepts in various subjects or fields of disciplines could play a vital role in providing holistic education (Barzilai & Blau 2014; Qian & Clark, 2016; Chang et al., 2018). A study by Zirawaga et al. (2017) buttress this point by stating that employing games in teaching and learning should be viewed as very instrumental rather than interference since it impacts learners in several ways by introducing, developing and

equipping them with skills such as engagement and motivation, visual skills, effective collaboration and interaction with peers. Other skills include problem solving and critical thinking capabilities, creativity, adaptation and sticking to rules or sportsmanship (Ucus, 2015). Pratama and Setyaningrum (2018) conducted a research on the effect of games designed towards problem-solving capabilities that examine learners cognitively and affectively in Indonesia. The findings indicated that leaners who participated in the study improved very well in their learning outcome compared to those who did not. Several studies have reported a direct correlation between game-based learning programs to learner's performance (Bakan and Bakan, 2018). In addition to performance, games are used to complement the learning process to eliminate boredom and stimulate learner's interest to channel their innovative thinking abilities and attention to what is being taught. This promotes effective participation of learners in the learning process as well as enhancing their understanding of concepts (Braghirolli et al., 2016). In the light of limited teaching resources for learning (Quansah et al., 2019) games offer an alternative in terms of engaging learners in the learning process in order to enhance their manipulative skills. Inasmuch as games are considered as an effective tool in the teaching and learning process and more importantly serving as an integral part of instructional pedagogy, Aina (2013) draws attention to the fact that the teacher's preparation towards the lesson which includes the choice of game and its usefulness can influence the effectiveness of the learning process. Some games may possess the requisite potential to instil smartness, logical reasoning and critical thinking into learners but may not contain the examinable instructional content to cause the needed change in the learner. It is very imperative that before games are incorporated in teaching and learning process, teachers would adequately plan ahead stating clearly the objectives, the delivery procedure and items to examine learners in order to ascertain the outcome of the lesson. On the part of learners, the learning process can be very tiring especially at the primary level to the extent that in some cases the learning goals may not be completely achievable. Diana (2010) complained about a noisy and disorganised learning environment when dealing with third grade learners using games which constrained the teacher in respect to time from explaining more to their understanding. However, as already mentioned, it all boils down to the effective planning of the entire teaching and learning process by the teacher. When that is done, a more efficient learning process and orderly controlled environment can be attained as well as achieving the objectives of the lesson.

The Impact of Games on the Learners' Attendance

The trend of research recently in the area of utilizing games in teaching and learning processes is highly encouraged as a result of the level of motivation and interest learners derive which in totality help them to develop the desired behaviour (Ofosu-Ampong, 2020). Learners most often lose interest in learning abstract concepts presented in a monotonous manner through the conventional method of teaching which some researchers describe as poor (Azure, 2015). This to some extent discourages learners from being punctual in school. Once their interest is not sustained in class activities, they tend to resort to other sources of entertainment outside the classroom. Yeboah et al. (2019) reiterate that developing countries such as Ghana lack adequate teaching resources especially in the area of science which requires the demonstration of more practical sessions to stimulate the interest and enhance the comprehension of learners on scientific concepts. The lack of learner's ability to relate with the activities in class already takes the learner out of class even when he/she is present physically. To this end, no meaningful learning take place. Unfortunately, there is rarely published research works that tries to link the use of games in education to learner's attendance. However, it can be deduced so far from the information available the positive impact games would make on learner's attendance as their motivation and satisfaction in the learning process increase. A child who enjoys the learning activities in class will always be present to continue the fun.

Students' Perceptions on Educational Games

It has been reported that games used in teaching and learning aid most learners to have better recall on topics learnt, improve their memorisation abilities, reduces the frequency of revision and enhances knowledge application during assessment. Also, some learners believe that games allow them to revise in comfortable and relaxed mood while being entertained as well. (Cheung, 2021). Others also are of the view that games increase their motivation and activity in learning (Salsabila et al., 2019). Again, learners consider the use of games in teaching and learning as a catalyst which motivate and influence them positively in attitude during lessons compared to the conventional methods of teaching (Ibrahim et al., 2011).

Despite the positive impact of games on learners in teaching and learning, some few learners think they are negatively affected to some extent. Some have testified that games distract their focus and concentration when used in learning. Subsequently, it becomes tough for them in grasping the concepts in lessons (Salsabila et al., 2019). Others think that excessive use of games in teaching and learning results in the neglect of other sources of materials used for learning (Repolusk, 2009).

RESEARCH OBJECTIVES

Generally, the study was setup to investigate perceptions and readiness of integrated science teachers at the public Junior High Schools in Akyem Oda, the capital of the Birim Central Municipality in the Eastern Region of Ghana on games. The was guided by the following specifics;

a) To determine the method most frequently used by teachers in teaching integrated science.

b) To determine the readiness of integrated science teachers to use games in teaching.

c) To determine the perceptions of integrated science teachers on the use of games in teaching integrated science.

d) To establish the correlation between the desire to use games in teaching integrated science and age of teachers.

RESEARCH QUESTIONS

a) What is the method most frequently used by teachers in teaching integrated science?

b) How ready are integrated science teachers to use games in teaching?

c) What are the perceptions of integrated science teachers on the use of games in teaching integrated science?

d) Is there a correlation between the desire to use games in teaching integrated science and age of teachers?

METHODOLOGY

Research Design

Descriptive research design (quantitative) was adopted for this study. It was purposely chosen because its focus is to identify the "what" behind a situation/phenomenon (Manjunatha, 2019) which suited the pursuit of the study to establish the perception and readiness of integrated science teachers towards the use of games in teaching and learning.

Participants Population for the Study

The population for the study consisted of all the thirty-seven (37) integrated science teachers at the public Junior High Schools in Akyem Oda, the capital of the Birim Central Municipal in the Eastern Region of Ghana.

Sampling Techniques and Sample Size

Simple random sampling technique was used to select participants for the research. As a probability sampling technique, it was chosen to ensure a fair representation of all members of the population in the study (Bryman, 2004). Thirty-two (32) Integrated Science teachers were sampled from the total of thirty-seven (37) for the study. This included six (6) females and twenty-six (26) males. Random number table was used to select the participants. In this, each of the thirty-seven (37) Integrated Science teachers was assigned a specific number (from 1-37) in place of their names. The table comprised of ten (10) columns and rows each creating one hundred (100) boxes. Each box had a three-digit number for selection. However, the first two-digits in every three-digit number in a box qualified for selection. Numbers that reoccurred/repeated were only considered once. Selection was initiated randomly by pointing on the first number in the first column without looking on. Upon the selection of the first number, the remaining thirty-one (31) were selected by following the boxes below the column and through other columns from left to right.

Instrumentation and Data Analysis

A questionnaire titled; "Using games in teaching integrated science; the perception and readiness of teachers" was used for the study. Its structure consisted of both open and close-ended questions. Questionnaire as a data collection tool was adopted for its uniqueness and ability to reveal the opinions and determine the future intentions of people (Young, 2016) which rightly suited this study.

The questionnaire composed of four (4) Sections:

a) Section A had the sub-heading, "Demographic information of integrated science teachers". This section was meant for data on age range, gender, number of years in teaching service and number of years in teaching integrated science.
b) Section B had the sub-heading, "Teaching methods mostly used in teaching integrated science". The section specifically was meant to get the most and least used methods by the Integrated Science teachers in teaching.
c) Section C had the sub-heading, "Readiness of Integrated Science teachers to use games in teaching". The section had six (6) questions (both open and close ended) which solicited the readiness of the Integrated Science teachers to use games in teaching.
d) Section D also had the sub-heading, "Perceptions on the use of games in teaching Integrated Science". It consisted of nine (9) statements measured on a five (5) point Likert Scale with the responses;
    1. Strongly disagree (SD)
    2. Disagree (D)
    3. Indifferent (I)
    4. Agree (S) and
    5. Strongly Agree (A)

The data from the study was analysed with IBM statistical package for the social sciences (SPSS) software (version 21.0). Data was generally subjected to descriptive statistics of means, standard deviations, frequencies and percentages. Pearson's correlations analysis was also employed on an aspect of the data.

RESULTS AND DISCUSSION

The result revealed that most of the respondents (62.5%) used the demonstration method of teaching during their integrated science lessons whiles the discovery method (6.3%) and games (6.3%) are the less used methods among respondents (**Table 1**). This indicates that demonstration method seems the most reliable and convenient method for teaching integrated science among respondents. This disagrees with an earlier finding (Otami, 2019). Games and the discovery methods being the least used among respondents could be the respondents' preference for other methods, unsuitability of the methods for teaching integrated science or other hindering factors. It has been reported that teachers scarlessly use games in teaching science since it is an emerging method which the knowledge and significance in teaching and learning is less known especially in the

developing world (Marques and Pombo, 2021; Aina**,** 2013). More so, science teachers are often unwilling to use new practices in their teaching (Pombo *et al*., 2019; Ertmer & Ottenbreit-Leftwich, 2010).

Table 1.: Teaching methods mostly used by respondents for teaching integrated science

Teaching Method	Frequency	Percentage
Lecture	3	9.4
Discussion	5	15.6
Discovery	2	6.3
Demonstration	20	62.5
Games	2	6.3
Total	**32**	**100**

Source: Field data of the study

From the results, 17(53.1%) out of the 32 respondents have previously used a form of game in teaching integrated science (**Table 2**). This describes a situation of fairly good number of respondents with some level of knowledge in games as a method for teaching. Also, it depicts a zeal among the respondents to use or test games for teaching and learning in integrated science. Out of these 17 respondents, 9 (52.9%) recognized it as an effective method for teaching and learning the subject. However, 8 (47.1%) of the respondents believe otherwise (**Table 2**). Though the percentages seemed close, there appear to be a sort of confidence among majority of the respondents in the effectiveness of games in teaching and learning of integrated science. This affirms the stance of other teachers who believe integration of games in teaching and learning have positive influences on the learning process and the outcome (Yeboah *et al*., 2023).

Table 2. Previous use of games in teaching integrated science and its effectiveness

Previous use of games in teaching science			Games as an effective method in teaching science		
Response	Frequency	Percentage	Response	Frequency	Percentage
Yes	17	53.1	Yes	9	52.9
No	15	46.9	No	8	47.1
Total	**32**	**100**	**Total**	**17**	**100**

Source: Field data of the study

The study showed more negative perceptions inclination of respondents towards the use of games in teaching and learning than the positives. Relatively, highest means were recorded for the negatives than the positives perceptions. “Games induces fun rather imparting knowledge”, “Games cannot be used to teach practical concepts”, and “Games are appropriate for all subjects except science” with the respective corresponding means and standard deviations; (M=3.367; SD=1.0662), (M=3.167; SD= 1.3667) and (M=2.767; SD=1.3047) topped the list of perceptions **(Table 3)**. These could be discouraging factors for the integrated science teachers from using games in teaching and learning. Larbi (2020) and Kubekov *et al*., (2015) have indicated that frequent use of games in teaching and learning could be distracting through fun, could induce excessive focusness of learners on the events in the games rather than the knowledge and educational significance. Again, the assertion of majority of respondents that “Games cannot be used to teach practical concepts” and “Games are appropriate for all subjects except science” conforms to the reports of Larbi (2020);Gerber &Price (2013) that games are not suitable styles for science teachers to better teach to the understanding of learners. The lowest means recorded for the positive perceptions; “Games promote better recall and application of knowledge”, “Games arouse and sustain learners’ interest” and “Games ensures better learner-centeredness and involvement” with the respective and corresponding means and standard

deviations; (M=1.500; SD=0.9377), (M=1.367; SD=0.6687) , and (M=1.700;SD = 0.9523) proved that respondents acknowledge other teaching methods being better than games in teaching and learning of integrated science **(Table 3)**. This disagrees with an earlier finding (Zirawaga *et al*., 2017).

Table 3. Perception of respondents on the use of games in teaching integrated science

Perception Deviation	N	Mean	Std.
Formulating games is time consuming	32	1.0903	0.9783
Using games in teaching is time consuming	32	2.200	0.9965
Games induces fun rather imparting knowledge	32	3.367	1.0662
It is appropriate for all subjects except science	32	2.767	1.3047
Games cannot be used to teach practical concepts	32	3.167	1.3667
Games enhances understanding of learners than other teaching methods	32	2.233	1.3566
Games ensures better learner-centeredness and involvement	32	1.700	0.9523
Games arouse and sustain learners' interest	32	1.367	0.6687
Games promote better recall and application of knowledge	32	1.500	0.9377

The study, in a way to determine the readiness of respondents to use games in the future for teaching and learning of integrated science revealed that 18 (56.3%) out the 32 respondents would wish to (**Table 4).** This presupposes the existence of conviction among some respondents that games as a method for teaching could enhance the effectiveness and outcome of teaching and learning in integrated science. This has been confirmed in earlier studys (Hwang and Chen 2017; Ezeugwu *et al*., 2016 Boyle; 2011).

Table 4. The desire to use games in teaching integrated science in future.

Response	Frequency	Percentage
Yes	18	56.3
No	14	43.7
Total	**32**	**100**

Source: Field data of the study

A correlation analysis between the desire to use games for teaching integrated science and age of respondents showed a negative and low correlation (r = -0.058, N=32, p= 0.76) between the two variables. This could imply that the desire to use games in teaching and learning of integrated science decreases with increasing in age of respondents. This might be so and high when games are new and more technology based (Charness & Boot, 2009) especially to teachers in developing countries. Therefore, it is likely for younger integrated science teachers to use games in teaching than the older ones. This agrees with the findings of Hamari and Nousiaien (2015).

Table 5. Correlation between the desire to use games in teaching integrated science and age of respondents

		DeGTIS	AoT
DeGTIS	Pearson Correlation	1	-.058**
	Sig. (2-tailed)		.760
	N	32	32
AoT	Pearson Correlation	-.058**	1
	Sig. (2-tailed)	.760	
	N	32	32

Source: Field data of the study; DeGTIS = Desire to use games in teaching integrated science; AoT = Age of Teachers; **Correlation significant at the 0.01 level (2 tailed)

RECOMMENDATIONS

We recommend that further research should be done to cover all the population of integrated science teachers in state owned Junior High Schools within the entire Birim Central Municipal. This will help to expand and consolidate the findings from the study. Again, the knowledge of the teachers in games as a teaching method and their expertise in designing games should also be studied.

CONCLUSION

The study established that most integrated science teachers at the Junior High School level often use demonstration method and less of games in teaching and learning. A few out the teachers who have previously used games in teaching agreed to the fact of it being an effective method of teaching integrated science at the Junior High School level. However, there is a higher wish/readiness among respondents to use games in teaching in the future. The study further determined the existence of a higher negative perceptions on the use of games in teaching integrated science than the positives. It also showed a negative correlation of the desire to use games in teaching and learning of integrated science and age of teachers.

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