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Game-based learning in Ghanaian primary schools: listening to the views of teachers

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ABSTRACT

This research explores how primary school teachers use games to enhance pupils' learning and development of conceptual knowledge. The study employs an illustrative case study design; data was collected through interviews with thirty (30) teachers who were selected using purposive sampling technique. Twenty teachers had some knowledge of game-based learning, ten teachers, however, did not know anything about the concept game-based learning. The results show that the use of non-digital games of different kinds to engage pupils is common in the learning of Maths, English, and Science. Teachers ascribed positively that the integration of game-based learning motivates pupils to come to school, actively engages them in the learning process, helps pupils to easily assimilate lesson contents, makes lessons lively and fun, and builds collaborative skills amongst pupils. Inadequate resources, noisy classes, time constraints, large class sizes, the reluctance of some pupils to participate, and inadequate knowledge are challenges reported by the teachers.

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Game-based learning; Primary education; Knowledge and usage; Impact and challenges; Instructional strategy

Introduction

Teachers adopt different instructional strategies in their quest for supporting students' learning and improving achievement through understanding the content of instruction. They equip teachers to make learning interesting and awaken students' desire to learn. Instructional strategies focus on not only the content knowledge but also on the pedagogical content knowledge and the environment of the teaching process. Research by Richa (2014) shows that despite the importance of different instructional strategies in supporting students' learning, students' development levels, interests, and experiences should be considered while choosing a particular teaching strategy so that they can self-accomplish their goals.

Game-based learning is an instructional strategy that utilises gameplay to deliver the content of instruction to students (Harbringer Knowledge Products 2012). At the basic level of schooling, game-based learning can be used to make teaching and learning fun and interesting for learners because at this level the learners are young and need support systems to be able to comprehend abstract information. Gameplay can be used to explain concepts better so learners will be having fun whiles learning the school curriculum. This strategy is, therefore, a relevant strategy at the basic level. With this instructional strategy, teachers can engage learners in using both digital and non-digital games for learning. Games, as an instructional strategy, come with a lot of benefits. Games can be used to engage, involve and immerse students in the content material so they learn more

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effectively because emotions experienced during play can vary through joy, empathy, anger, frustration, or triumph. This succession of emotions tends to keep the players immersed (Boyle 2011). Games can also be used to demonstrate an idea in real-life situations and to promote collaboration among students. Game-based learning can increase players' self-confidence, motivate students to learn, encourage students to learn from their mistakes, and promote long-term memory of an instruction (Hwang and Chen 2017; Boyle 2011).

To effectively use games for teaching and learning, teachers need to know how it operates and must be willing to make provisions for its incorporation into the learning process. In Ghana, like in most developing countries, teaching and learning are mostly done abstractly without recourse to concrete and interactive strategies which tend to make lessons teacher-centred, boring, non-interesting and difficult for students (Yeboah, Asante, and Opoku-Asare 2017). This practice can result in a lack of interest in academic work and low academic performance. For example, a study by Ofosu-Asante (2020) on primary pupils' learning experiences in a traditional learning setting and twenty-first-century learning setting in Ghana showed that pupils in the traditional learning setting were found to be more passive and dependent on their teachers because the strategies that are supposed to actively engage them were not used often. On the other hand, in the twenty-first-century setting, the strategies used actively involved the pupils participating in the learning process to take greater responsibility for their learning. Concrete and interactive learning strategies like game-based learning can help prevent or do away with passive and teacher-centred learning which does not motivate learners to engage actively in the teaching and learning process.

An extensive review of the literature established that very few studies have examined game-based learning within the Ghanaian context. All these studies (Appiah 2015; Nabie 2015; Putier 2014) have focused on the use of games in teaching mathematics and literacy studies. In one of these studies (Putier 2014), the researcher herself explored the game opportunities with the pupils but not the teachers. There is therefore the need to know the knowledge base of the teachers themselves regarding game-based learning, whether they use it to teach, how they use it with all subjects, and their experiences. This study focuses on four objectives which are: To ascertain primary school teachers' knowledge of game-based learning as an instructional strategy; to find out the extent to which game-based learning is being used as a teaching strategy in primary schools; to find out the impact and challenges of game-based learning at the primary school level. The research questions the study sought to answer are, therefore:

1. What is the knowledge base of primary school teachers on game-based learning?
2. How is game-based learning being used as an instructional strategy in primary schools?
3. What is the impact of game-based learning on pupils' learning at the primary school level?
4. What challenges do primary school teachers encounter when implementing game-based learning?

Literature

The concept of game-based learning

According to Salen and Zimmerman (2004, 80), a game is 'a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome'. On the other hand, Shaffer et al. (2005) purport that game-based learning is a type of gameplay with defined learning outcomes. Game-based learning involves designing learning activities that can incrementally introduce concepts, and guide users towards an end goal. They can incorporate competition, points, incentives, feedback and allow students to engage with educational materials playfully and interactively (Pho and Dinscore 2015). Israel (2017) adds that game-based learning is the integration of actual games into the learning process to achieve specific learning objectives. It provides an environment for learners to become immersed in the learning process and to have fun while

learning. Tang, Hanneghan, and Rhalibi (2009) provide the following as the characteristics of game-based learning:

- Motivating and engaging but not necessarily entertaining;
- Requires participation from learners;
- Has clear learning objectives defined in the game-play and scenarios presented while knowledge can be imparted through storytelling and narrative;
- Scenarios defined are reflective and transferable to the real-world experience;
- Provides freedom to interact in the game world through a set of defined actions;
- Provides clearly defined feedback for every action taken;
- Both assessment and lesson can take place during game-play;
- Matches learner's pace and intellectual ability;
- Highly scalable so can be used for educating large numbers of learners concurrently.

For this study, game-based learning is defined as the use of both digital and non-digital games to deliver lesson content to achieve set objectives.

Primary school teachers' knowledge of game-based learning

Investigating primary school teachers' views on game-based learning has received much attention for some time now. For example, Ucus (2015), in analysing elementary school teachers' views on game-based learning as a teaching method, discovered that the teachers understood game-based learning as a process that involves collaborative learning, social learning, and learning from experiences with computers and educational games. According to the respondents, game-based learning as an instructional strategy can be incorporated into the primary school curriculum because primary school pupils become happy in active learning hence at that level the teachers think games will be a suitable element to use in teaching all subjects to help whip up the interest of the pupils to learn. Ucus (2015) further explained in his/her study that the teachers listed gameplay activities in the educational context to be role-playing, e-learning, creative drama, and playing educational games. In this study, the primary teachers used games in teaching subjects like physical education, literature, and social studies. A survey conducted by Egenfeldt-Nielsen (2011) in schools in the USA, Norway, Finland, Denmark, and Portugal on games and learning showed similar results in the countries, that is, most teachers from these countries had limited experiences when it comes to games as an instructional strategy. From this work, sixty percent (60%) of the participants indicated that they mainly use games to create variety in the learning process in order to enhance engagement levels and opportunities for learners.

Primary school teachers' usage of game-based learning

The use of games in the classroom is not new but the integration of game-based learning instructional strategy varies across different classrooms. A research study conducted on teachers' use of digital games from the curriculum in primary schools by Razak, Connolly, and Hainey (2012) showed that digital games were not widely used by primary teachers in Renfrewshire, Scotland. The findings indicated that lower primary teachers tend to use digital games for teaching more than upper primary teachers and that the age of the teacher did not play any relevant role when it comes to teaching with or without games. Maths and languages were subjects that the primary teachers mostly used games in teaching while RME and expressive arts were the least subjects that games were used to teach. According to Razak, Connolly, and Hainey (2012), the teachers used digital games to teach because they could get free online mathematics games that were appropriate to teach the math curriculum. Drill and practice, and Nintendo games were commonly used by the teachers. The main motivation for teachers using gameplay was because the pupils enjoyed this

learning process. From this study, it was deduced that most of the teachers who engaged in games for learning did not really have in-depth expertise but were only at the beginner level. This corroborates Allsop and Jessel's (2015) research on primary school teachers' experiences with games for learning in the UK and Italy which indicated that although teachers mentioned problem-solving skills, critical thinking, collaboration, and creativity as some of the impacts of gameplay in the classroom, they did not demonstrate the ability to design the game-based learning space and use it. Teacher personality and attitude were not the main reasons for not using games but rather obstacles and challenges such as; difficulties identifying the appropriateness of the content of a game to the curriculum, limited instruction time that does not support game-based learning, lack of technical infrastructure and difficulties identifying appropriate assessment for evaluating game-based learning outcomes. Regardless of these challenges, ninety-three percent of the teachers showed interest to learn how to use games for teaching and learning, indicating that they need training to equip them with skills in this area (Razak, Connolly, and Hainey 2012). Another study on teachers' beliefs in game-based learning from Turkey, UK, and Italy indicate that teachers are interested in teaching with digital games and they see digital games as an effective educational tool. The teachers' use of games in teaching varied in the three countries (Allsop, Yildirim, and Screpanti 2013).

Game-based learning in some African countries

The use of language games to improve lower primary pupils' reading, writing, and vocabulary skills was experimented with by Putier (2014) in Ghana. The findings show that the experimental group showed a significant difference in reading, writing, and speaking during and after the experiment. From this study, the experimental group outperformed the control in all exercises that were given to both groups. The mean scores for both groups were found to be in favour of the experimental group. Language games were identified to determine 10.3% of the variance in reading, 33.5% of the variance in writing, and 75.9% of the variance in speaking. The study indicated that language games improved the literacy of the primary pupils (Putier 2014). Nabie (2015) also conducted a study on primary school teachers' use of cultural games to teach mathematics in the Upper West region of Ghana. The findings revealed that the teachers see games as a resource for social, cultural, cognitive, and instructional improvement. The teachers revealed that cultural games provide useful engagements among the pupils and they ultimately stimulate learning. The study shows that the usage of cultural games in school connects the school to the community. Teachers see playing cultural games as a social enterprise where school pupils, teachers, and community members connect to learn and share mathematical ideas and values. Just like the studies by Razak, Connolly, and Hainey (2012) and Allsop and Jessel (2015), although the teachers in this study recognised the educational value and relevance of cultural games the data indicates that they could not implement the gaming approaches to achieve its value (Nabie 2015).

In another study by Appiah (2015) on using gamification to improve mathematics at the primary school level in Ghana, the findings show that training the participants on how to gamify a lesson helped them to be able to gamify math lessons for the pupils. The gamified lesson designed by the teachers contributed significantly to the effective teaching and learning of mathematics at the lower primary. The gamified classrooms ensured active pupil participation that enabled them to think, feel and act creatively, resulting in the development of desirable values such as tolerance, sharing, cooperation, affection, and endurance (Appiah 2015).

Ezeugwu et al. (2016), in a study conducted in Nigeria on the use of games for teaching algebra at the basic level, found that pupils who were taught with games performed better than those taught without using games. On the contrary, using games for military academy instructions at the Master's level in South Africa showed no difference in terms of student outcomes regarding students who were taught using games and students who were taught using traditional methods of teaching. This implies that games can be used alongside the traditional method because they are able to provide the same results as the traditional method and also enable learners to learn in an interactive

and engaging environment (Dreyer 2017). Again, the use of digital games in a multicultural sports studies classroom helped to foster a unique cross-cultural engagement amongst diverse students which was not the case when normal face-to-face interactions were used. This helped in bridging cultural barriers which can be built on outside the classroom. This study showed that randomised diverse grouping of students resulted in a better learning process because students had opportunities to learn new things from their peers which made them confident and affected their performance positively. Through the use of digital games, social practices of cross-cultural interaction were shaped positively (Titus 2016).

Bayeck (2018), in her work on selected African board games for learning, identified that African board games can be used for learning in the classroom. For example,

> an instructor in a maths class can have students draw the game of 'Morabaraba' and calculate how many rows of three pebbles in a row can be created with a total of 24 stones. This activity can help students practise division and multiplication. Such activity can facilitate students' understanding of these mathematical concepts because by drawing 'Morabaraba' students will engage in a visual representation of the problem, and thus be able to represent the mathematical ideas and problems in visual forms (Bayeck 2018, 546).

Likewise, according to Bayeck (2018), the repetitive moves in the 'Bao' or 'Oware' game can be used to explain the cell cycle in biology thus putting the seeds in the holes can be likened to the process where a cell accumulates nutrients and doubles its genome. The only situation that is hindering the use of such games in African classrooms is educators' ability to integrate such games into the curriculum for learning.

Impact of game-based learning

Game-based learning is an innovative and active instructional strategy which offers educational value that enhances the teaching and learning process. In a study by Ebner and Holzinger (2007) on how online games contribute to student learning, it was deduced that both the use of the traditional method and the online games achieved the same outcome, but with respect to the online games, students had fun and enjoyed playing the game to learn and still achieved equal results. On the contrary, Huizenga et al. (2009) purport that the use of mobile games by pupils to learn content on medieval Amsterdam showed that the pupils who played the mobile games to learn attained higher scores on knowledge test on medieval Amsterdam compared to the pupils who were taught using project-based lessons. In the same vein, Liu and Chen (2013) report that the use of card games in teaching primary school students about energy and transport showed that the card game significantly increased students' content knowledge in energy and transport which was evident from the pre-and post-test. Before these studies, Kiili (2007, 403) had ascertained from his study that 'properly designed educational games can be used in higher education to make complex theoretical knowledge more approachable' as traditional learning methods mostly fail to do same. The use of games also motivates students to learn (Hwang and Chen 2017; Ezeugwu et al. 2016) as it was recorded that all the students played the online game a second time. Again, the use of the online games prompted incidental learning as students discovered their mistakes and decided to correct their mistakes in addition to finding out why they made mistakes (Ebner and Holzinger 2007). Since digital games are played using innovative devices, apart from these devices helping students to learn the school subject, Ebner and Spot (2015) discovered that these devices might help improve the hand-eye coordination skills of students. Jabbar and Felicia (2015) in agreement with this assertion conclude in their study that Game-based learning helps students to develop relevant skills, and knowledge and strengthens their ability to handle learning experiences as a result of the application of games. Pinder (2021) adds that this instructional strategy helps to develop critical thinking and problem-solving skills among students. Primary school teachers, in Pinder's (2021) study also acknowledged that games in the learning process provide opportunities to actively engage pupils to learn while having fun and make pupils keen to participate in the learning process.

Perrotta et al. (2013) discuss further impacts and potential impacts of game-based learning in education:

- Five studies that sought to measure 'academic achievement' with the use of games identified some degree of improvement. A meta-analysis of other studies observed significant but undefined, cognitive gains across studies utilising games versus traditional teaching methods. Four studies, however, found no impact on academic achievement.
- Five studies on game-based learning consistently found that video games can bring about motivation, engagement, broader knowledge acquisition, and impact positively on problem-solving skills. Five studies that focused on problem-solving skills found some degree of improvement, and the majority of the studies examining the impact of video games on student motivation and engagement found positive results. However, it was unclear whether this impact could be sustained.
- Few research works on gameplay have focused on attitudes to learning as a possible outcome and their findings vary. A study found that games promoted a positive attitude to learning maths. Another research explored academic self-concept in math and found no improvement. A meta-analysis found that better attitudes towards learning were obtained significantly with subjects that used interactive games or simulations, compared to the traditional methods of instruction.
- Although the area of game-based learning has made some impacts, the current literature does not adequately give clear evidence of the link between motivation, attitudes to learning, and learning outcomes.

Challenges teachers face when implementing game-based learning

According to Kiili (2007), cognitive overload in addition to the tempo of a game being too fast can disturb the reflection process in game-based learning. The success of game-based learning is in its simplicity of use. In this regard, all students must be able to play the game without being obstructed with lengthy and cumbersome instructions (Ebner and Holzinger 2007). Putier (2014) reports that in using language games to teach primary school pupils, the pupils were reluctant to work with each other in groups; it took encouragement and persuasion through the use of interesting group names and slogans for the pupils to finally accept to work in groups. Another interesting challenge encountered by Putier was that the boys in the class where the research was conducted were not ready to accept girls in their groups and had to be persuaded to do so. Again, some pupils were absenting themselves from class during the language games because their group members made fun of them as a result of not performing well in the group work (Putier 2014). Health-related issues were raised by some teachers as a challenge in using cultural games for learning because according to these teachers, the procedures used in playing such games make the pupils dirty (Nabie 2015). Another concern raised in Nabie's research was the fact that since primary pupils play cultural games in their homes for the fun of it, they do not know their value as a vehicle for learning school subjects. Here, teachers have a responsibility to help students know the connection between games and school subjects. The study also revealed that during non-digital game-based learning activities, the noise level in a class goes up and there can also be issues of violence amongst the learners if some of them decide to use unfair means to win the game at all cost. This can disturb the learning process and other classrooms in the school (Nabie 2015). Participants in a study conducted by Ucus (2015) expressed that implementing game-based learning demands a lot of time to plan for it and also demands enough time for its implementation. Difficulty in designing games considering students' interests and abilities, organising and managing the game-based class, monitoring all students during gameplay, students' behavioural problems and the unwillingness of students to participate are further challenges teachers face when implementing game-based

learning in the classroom. Also, evaluating or assessing learning with game-play is a difficult situation for most teachers to deal with (Egenfeldt-Nielsen 2011; Allsop and Jessel 2015). Furthermore, lack of clear frameworks on game-based learning within the school curriculum, designing a game-based curriculum, inability to identify games that will be relevant for individual subjects, lack of infrastructure to enable gaming sessions, administrative tasks during and around gaming sessions are some obstacles that prevent teachers from using games as an instructional strategy in the classroom (Marklund and Taylor 2016; Allsop and Jessel 2015). Kiili (2007, 394) had earlier purported that for game-based learning to be successful, ingredients such as 'authenticity, collaboration and learning by doing were found to be most important characteristics of effective educational games'.

Theories that support game-based learning

Gardner's multiple intelligences

This theory explains that every individual uses different learning strategies which relate to their internal strengths and capabilities. These learning strategies include, linguistic, musical, logical-mathematical, spatial, body-kinesthetic, intrapersonal, interpersonal, and naturalistic. The implication of this theory is that learning can become more effective if we focus on and develop instruction for these intelligences (Becker 2005). According to Becker (2005), one of the features of games that make them so engaging is that they address each of the multiple intelligences, by providing game players with rich experiences, where each player has an opportunity to take advantage of their strengths and capabilities.

Constructivist theory

The constructivist theory believes that people develop their knowledge through active participation during learning. The primary role of the teacher in a constructivist environment, therefore, is to provide the setting, pose the challenges, and offer the support that will motivate or encourage learners to create their own knowledge through their personal experiences (Golder 2018). This implies a participatory process by students, who interact with their environment to solve the situation that is being set out for them. Game-based learning is built upon a constructivist type of learning because it provides an opportunity to actively engage learners in a challenge and guide them to learn through the process. The theories are reflected in the literature review and analysis.

Methodology

The research employed an illustrative case study design as a means of collecting and analysing data to find answers to the study's research questions. An illustrative case study is descriptive in nature and is used to examine a situation in order to help others to understand it better (Hayes, Kyer, and Weber 2015). This type of case study is appropriate for the research because it provided the opportunity to explain in detail the primary school teachers' experiences in integrating game-based learning with their pupils. The target population for the current study was all primary school teachers from the Dodowa District in the Greater Accra of Ghana. The primary one, three, and six teachers were purposively selected from all nine (9) public primary schools in Dodowa, making thirty (30) primary teachers in all. Primary one, three and six teachers were selected because they form the starting, middle, and end points at the primary level.

A semi-structured interview was used for collecting data from the participants in relation to their knowledge, usage, benefits, and challenges of game-based learning practices in their classrooms. The interview schedule had four sections; the first section had questions pertaining to the respondents' knowledge about game-based learning; the second section had questions seeking to understand how the participants use game-based learning in their teaching. The third and fourth sections

asked questions on the impact and challenges of game-based learning that the teachers had experienced with their pupils. Validity and trustworthiness were ensured by giving the interview questions to an expert in education research to ascertain that the questions adequately covered the research focus. The researchers spent adequate time on the field to gather detailed data; the interview data was analysed and presented as it was collected to give an accurate account.

Permission was sought from the Dodowa District Education office to conduct the study. Heads of schools and the primary teachers were then visited and informed about the purpose of the study. The teachers were made aware that participation was voluntary so teachers who consented to participate were engaged. The teachers were interviewed at their convenience in their respective schools during their break time. Since the researchers were interested in developing an in-depth understanding of the meanings from the participant's responses, the thematic analysis approach by Braun and Clarke (2006) was used. The first step of the analysis focused on the examination of interview transcripts to understand the data from the teachers to generate initial codes and search for themes. The identified themes were reviewed and defined for the write-up. The themes were used in presenting and analysing the data to answer the study's research questions. Anonymity was ensured by not using the real names of the teachers and schools rather unique names were used to protect their identities. Information obtained was also held confidential on protected computers.

Results

Primary school teacher's knowledge of game-based learning

From Table 1, considering the thirty (30) teachers interviewed from the nine (9) primary schools, thirteen of the teachers knew what game-based learning is and could express themselves correctly about the concept, seven of the teachers had a fair idea about the concept because they could not express themselves accurately about the concept and ten of the teachers had a wrong knowledge about the concept game-based learning.

Table 1. Participants' knowledge of game-based learning.

Class Level of Teachers	Good knowledge of Game-based learning	Fair knowledge of Game-based learning	Wrong knowledge of Game-based learning
Primary 1	3	4	3
Primary 3	4	2	4
Primary 6	6	1	3
Total	13	7	10

In unison with Pho and Dinscore (2015) and Israel (2017), majority of the participants were able to express and explain that in game-based learning students are made to actually play a game to learn a lesson content. The teachers who had a fair idea of what game-based learning is also articulated that it is a learning process that involves and engages learners in activities and were able to give examples of such activities they used to engage their learners. For the ten teachers, just like the teachers in Ucus (2015) study, they articulated that game-based learning is the use of songs, poems, rhymes, drama, role play, dancing, singing, and teaching and learning materials to engage students. Here critically considering the assertions by Pho and Dinscore (2015) and Israel (2017) on the concept of game-based learning and studies on game-based learning by (Putier 2014; Nabie 2015; Appiah 2015; Ezeugwu et al. 2016 Dreyer 2017), the concept is not just about making students sing, dance, recite poems or rhymes, do a drama or role play, or just use learning materials to teach students as the teachers articulated, but the concept game-based learning practically means making students play a game and learn a lesson content to achieve some educational goals.

The data from Table 1, shows that more than half (20) of the participants had a good and fair knowledge of what game-based learning is; this is positive because it can influence the teachers to engage learners in gaming activities and reap the relevant benefits that the implementation of game-based learning offers. On the contrary, the rest of the participants know that they are engaging their pupils in games to learn but that is not the case. This data suggests that in-service education and training on game-based learning is crucial for these teachers and other teachers like them across the country to help them get familiar with the concept and know how to use it with students to also derive the benefits the concept offers in education.

How game-based learning is being used as an instructional strategy in primary school

With the exception of one participant, the rest of the twenty-nine (29) participants indicated they use games to teach students. This particular participant is part of the ten teachers whose knowledge about game-based learning is wrong. With respect to the twenty-nine teachers, considering the knowledge of nine of the teachers on game-based learning, it is clear what they refer to as game-based learning is not actually game-based learning.

Some games that the twenty (20) participants have been using to teach their lesson include football games, card games, hopping games, draft, '*ludu*' (local game), hot seat, puzzle, mother and child, '*oware*' (local game). Six of the teachers indicated they engage their pupils in playing games as a starter to a lesson. A participant articulated that '*we have just been introduced to the concept but we were asked to use it as starters*'. But according to Zhang (2018), games can be used at the start of the lesson, in the middle, to conclude a lesson, and also as a strategy to revise lessons taught already. The rest of the fourteen teachers asserted they use games as both starters and to deliver actual full lesson contents. Some subjects that the teachers use games to teach include Mathematics, English, and Science. Like in Razak, Connolly, and Hainey's (2012) study, games are used by the primary school teachers in this study mostly to teach Maths and English, but only one teacher indicated he uses games to teach Science. Some of the teachers mentioned that games cannot be used to teach certain subjects like history and science, for example, a teacher articulated that '*some subjects do not require the use of games like science*' but another teacher explained how she has been using games to teach science. According to Makarova et al.'s (2018) study, games can be used to teach history lessons where students perceive, study and master the environment, which develops independence and activates self-directed learners. All the teachers with the exception of one indicated they only use non-digital games to engage learners because of lack of resources such as computers and internet connectivity for the pupils to use. This situation is similar to Razak, Connolly, and Hainey's (2012) study which showed that digital games were not widely used by primary teachers in Renfrewshire, Scotland. In Ghana, as the teachers asserted, most public primary schools do not have the necessary digital gadgets, equipment, tools, and internet connectivity that teachers and pupils can use to learn, so this finding was not a surprise. Again, in Ghana, some public primary school classrooms do not even have electricity connection which makes it difficult for teachers and learners to use digital games to learn. To ensure that teachers use digital games alongside the non-digital games, public primary schools need to be provided with electricity and the necessary equipment useful for using digital games to learn. The teacher who mentioned that she uses digital games to engage the pupils indicated that she uses her phone to show them videos. This means that this teacher does not know what digital games are because it involves allowing students to play a digital game and learn through the process and not just an act of using videos to teach students.

Sample games that participants are using for learning were described. For instance, a primary six teacher explained how he uses a game called 'Mother and Child' to engage the pupils :

> I group them and give them a root word to generate other words from the root word. The groups are timed, and the group that is able to generate more correct words within the time wins. If there are wrong words we correct them.

A class three teacher also expressed how she uses games known as 'Lucky Dip' and 'Double – Double' to engage the pupils to learn:

> I write words on pieces of paper and put them in a container and ask the students to pick a word from the container and use it to form a sentence. For Double-Double, I mention Double-Double then I mention a number, for example, 2, and the students are supposed to provide the double of 2, that is 4.

Another teacher from class six described how she uses the 'Number Wheel Chart' game to engage learners:

> On a manila chart, I draw circles sometimes 4 or 5 and label them with place values such as billions, thousands, millions, etc. I pick students to throw stones on the chart and afterwards the stones in the circles are counted and written in thousands, millions, and billions.

Also, a class six teacher explained how he uses 'Ludu' to engage the pupils :

> When am teaching multiple numbers, I make them play a game like Ludu. Through this game, they are able to learn multiples in counting, odd numbers and even numbers. Also, I use the Ludu game when teaching probability.

A primary one teacher also made known how she uses 'Ampe' (Ampe is a traditional game that is played by jumping, clapping, and putting one feet forward when jumping. When the leader and the opponent have the same feet forward, the leader wins a point. If their feet are different then the opponent becomes the leader and plays against the remaining players) to engage the pupils:

> Sometimes when I am teaching counting in mathematics, I let them play a game like Ampe, and in the process of the Ampe they count the steps or the hands they clap.

Another primary one teacher expressed how she uses the 'Identification of Alphabets' game to assess the pupils :

> I write alphabets on cards, group the students and mention an alphabet and ask them to identify from the cards.

All these games that were described by the teachers are very useful and can help in implementing the requirements of the primary school curriculum. In Ghana, there is no distinct clear policy on game-based learning in training teachers or in using games to teach so teachers are left alone to work out how to teach with games like was cited by (Marklund and Taylor 2016; Allsop and Jessel 2015). This situation means teachers who do not know how to teach with games cannot engage in it and teachers who do not see the value of games in learning may not use them in the classroom. Such a situation can mean most classrooms in the country may not be benefiting from games as a relevant instructional strategy because student-teachers who graduate to handle these classrooms are not given practical training to integrate games into the learning process. Here, to ensure that games are implemented as an instructional strategy, student-teachers and practising teachers must be trained practically on how to use both digital and non-digital games in teaching and learning. After the interview with two primary six teachers, they asked questions to know more about game-based learning after which one articulated, '*we went for a training but what you have explained has made me understand things better than the training with respect to games*'. This indicates that game-based learning training should engage experts who can help give teachers the knowledge and skills they need to implement in their classrooms.

Impact of game-based learning at the primary level

Expressing their views on the impact of game-based learning in the teaching and learning process, some of the teachers indicated that the integration of games in the learning process motivates their students, and bring their minds to class to pay attention and learn. Three lower primary teachers particularly made it known that it ensures that their pupils come to school regularly and prevents absenteeism because of the perception of coming to school to play a game. This finding is consistent with

earlier studies (Hwang and Chen 2017; Ezeugwu et al. 2016; Liu and Chen 2013; Huizenga et al. 2009) which purport that children are motivated to learn and develop a conceptual understanding of what they are introduced to when the learning is blended with the use of games. The use of games is important in the development of primary school pupils because, as children, their attention span does not last very long, so games can be used to sustain their concentration in the classroom.

Some of the teachers also confirmed that when the pupils are made to play games to learn, it helps them to understand concepts taught easily, remember what they learn, and develop their cognitive skills because games create the opportunity to learn by doing. According to Kiili (2007), a properly designed game can be used to make complex theoretical knowledge more approachable to comprehend. Game-based learning can challenge learners to apply what they learn which allows them to develop their critical thinking skills (Allsop and Jessel 2015; Pinder 2021). In this regard, a primary six teacher articulated that '*the pupils are able to apply the games they learn in their homes and communities*'. Majority of the teachers made it known that there is active participation of learners when games are integrated into the teaching and learning process. A primary six teacher indicated that '*games boost their self-esteem because the shy children are able to come out of their shells to participate*'. Two primary six teachers also articulated that when the pupils work in groups to play games to learn, it builds a sense of teamwork amongst them to socialise and learn from each other. This helps them to learn to tolerate each other and work towards a common goal. This means that integrating games in teaching and learning moves the learning process from teacher-centeredness to learner-centred because students get the opportunity to actively participate and construct knowledge with their peers (Dreyer 2017). Such a situation ensures that learners improve their psychomotor skills, take responsibility for their own learning, and work to improve upon it. The primary school teachers further made it known that the integration of games makes their lessons lively, interesting, and fun for learners hence their willingness to participate. Najdi and El Sheikh's (2012) study claims that educational games can unlock a students' thinking and increase the feeling of fun while learning, therefore, reduce the burden of delivered information given by teachers. That is games create a challenging and constructively competitive atmosphere that facilitates interaction among students in a friendly and fun environment (Pinder 2021). Some of the teachers also shared that game-based learning makes teaching easy because they do not have to talk too much when using games to teach because of the activities involved in the process. Other teachers indicated that this instructional strategy helps them to save instructional time, learn new things through the process to continue to enhance their lessons, and help them to cater for different learning styles by varying their lessons.

Challenges primary school teachers encounter in using games for learning

A major problem the teachers raised was inadequate materials to continually sustain the implementation of non-digital games in their classrooms and lack of digital gadgets to implement digital game-based learning. As was evident from the data, all the teachers engaged the learners only in non-digital games because of the lack of technological gadgets. According to Marklund and Taylor (2016), the implementation of game-based learning at the basic level involves identifying materials and equipment useful for gaming activities in the school and acquiring useful resources that are lacking, making sure that the needed software and hardware are available for teachers and pupils to use. Another challenge that was raised was the fact that gaming sessions make the class noisy and class controlling becomes difficult. This situation was also identified in Nabie's (2015) study from the Upper West region of Ghana where during non-digital game-based learning activities the noise level in a class increases. Such a situation can distract the smooth implementation of the learning activity and can also disturb other classrooms. Teachers can manage this situation by giving rules on too much noise-making, such as deducting points, and also through appointing group leaders to help control their members. Though some teachers indicated that game-based learning enables them to save instruction time, four of the teachers also shared that the instructional

strategy takes a lot of instructional time. One of them articulated that '*if the game is not familiar to the pupils you have to make sure they understand and that can take time*'. Marklund and Taylor (2016) also noted that teaching novice students how to play games to learn, as well as helping proficient students in directing their gaming expertise toward learning, was the most time-consuming exercise for teachers in their study during game-based learning. Participants from Ucus (2015) study also noted time constraints when it comes to game-based learning. Large class sizes also pose challenges for some of the primary school teachers where there is not enough space in the class for gameplay and when pupils are made to play games individually, sometimes not every pupil is able to participate before the instruction time because of the number of pupils. Teachers can be helped to manage these challenges through appropriate expert training on how to effectively and efficiently manage learning using games with primary school pupils. A primary six teacher also mentioned that some of her students feel reluctant to engage in games to learn because they feel older as was the case in Ucus's (2015) study. Teachers must educate students on the learning purpose of this instructional strategy and award marks for the activities that take place so students can recognise the value of game-based learning. On the contrary, a primary one teacher asserted that '*teaching with games raises the expectation of learners so the class becomes boring when you do not use it*'. Some teachers articulated that they do not have adequate knowledge to efficiently implement game-based learning lessons and noted is difficult to teach some subjects with games. But teachers from Ucus's (2015) study purported that games are suitable for all elementary school subjects as a teaching method.

The conceptual framework developed from the findings of the study

Figure 1 explains that if primary school teachers are equipped with appropriate knowledge on the instructional strategy game-based learning, and provided with the equipment and resources needed for implementation, teachers are likely to integrate the instructional strategy into the teaching and learning process. This can create opportunities to actively engage learners, motivate them to learn, help them assimilate lesson contents, help to build their collaborative skills, and make lessons lively, interesting, and fun.

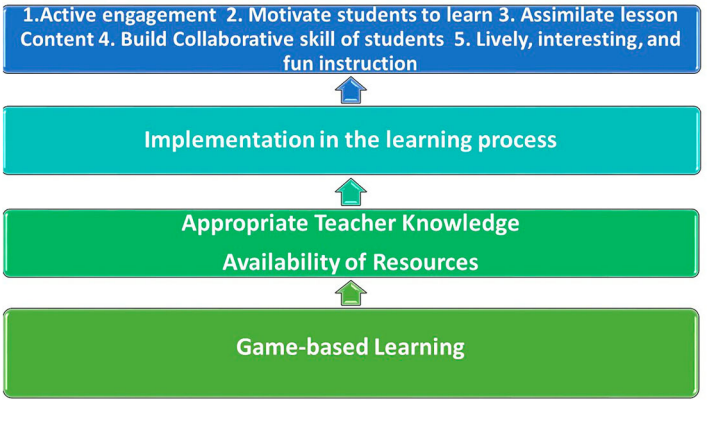

Figure 1. Conceptual framework from the findings of the study.

Conclusion and implications of the study

This study sought to find out Ghanaian primary school teachers' knowledge, usage, impact, and challenges of game-based learning. From the first objective, it can be deduced that more than half of the thirty teachers (20) had some knowledge of game-based learning which is positive and can be a

motivating factor for these teachers to use this innovative strategy and derive the benefits with their pupils. The findings also show that a good number (10) of the teachers also did not know about the concept of game-based learning, indicating that it is necessary and relevant to introduce primary school teachers to such innovative teaching and learning strategies through practical periodic training.

Twenty of the primary school teachers use non-digital games of different kinds to engage their pupils mostly in learning Maths, English, and Science because of the assumption that games cannot be used to teach all subjects. Again, such an assumption can be corrected with appropriate training. The sample of games that the teachers are using are relevant and can help them achieve the requirements of the basic school curriculum but only non-digital games are being implemented because of lack of equipment to implement digital games. For continues integration of non-digital and the use of digital games, primary schools must be provided with the materials and equipment they need to implement this instructional strategy.

With respect to the impact of game-based learning at the primary school level, it can be concluded that games motivate primary school pupils to come to school to learn and help actively engage learners in the learning process. The instructional strategy also helps pupils to easily assimilate lesson contents because of the practical nature of playing games to learn. The strategy also helps to build the collaboration skills of pupils and make lessons lively, interesting, and fun. In order to continue to derive these benefits, game-based learning must be sustained in primary school classrooms.

Lack of relevant resources, noisy classes, time constraints, managing gameplay with large classes, the reluctance of some pupils to participate, and inadequate knowledge to implement game-based learning were challenges that the primary school teachers encounter when using games to teach.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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