



## Effect of Game-Based Interactive PowerPoint on Students' Learning Outcomes in Civic Education in Zaria Education Zone of Kaduna State Nigeria

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### ABSTRACT

*Interactive PowerPoint is a new way of integrating PowerPoint in learning. It has been reported generically to have positive effects on learning outcomes. However, less emphasis is paid to the metaphor upon which interactive PowerPoint is built. This quasi-experimental study explored the effects of Game-based Interactive PowerPoint on students' attitudes and academic performance in civic education. Two research questions were raised and two corresponding hypotheses were formulated and tested at 0.05 level of significance. The study's population was 2,908 SS2 students in the 39 senior secondary schools in Zaria Education Zone of Kaduna State. The study's sample size was 130 SS2 'A' students drawn purposively from two intact classes from two different schools in Zaria Education Zone. The study used Civic Education Performance Test and Civic Education Students Attitudinal Scale for data collection. The scale was pilot tested using Cronbach Alpha Approach and a reliability coefficient of 0.85 was obtained. Descriptive statistics of mean, standard deviation and percentage were used in answering the study's research questions. Hypothesis 1 was tested using Analysis of Covariance while hypothesis 2 was tested using independents sample t-test. The study found that a significant difference exists in the attitudes and academic performance of students in the two research groups in favour of Game-based Interactive PowerPoint. The study, therefore, recommended that Game-based Interactive PowerPoint packages should be encouraged in schools for teaching civic education.*

### INTRODUCTION

The fundamental role of producing competent and effective citizens by the education industry is becoming more complex in this age where nook and cranny of the society have been transformed by digital technologies that 21st-century anchored. The integration of these technologies in socio-economic and political institutions is gradually making human interactions more of digital technology-dependent (Garba, Byabazaire

& Busthami, 2015). It's therefore required of the education industry to use these technologies in implementing the educational programme for 21st-century learners. This will enable the industry to meet up with her primary responsibility of equipping the learners with what it takes to fit into the larger society. It is worth noting that most of these digital technologies are not primarily designed for the educational industry but the need to create teaching and learning environment that mirrors the reality of the

### ARTICLE INFO

#### Article History

Received: January, 2020

Received in revised form: March, 2020

Accepted: June, 2020

Published online: September, 2020

### KEYWORDS

PowerPoint; Linear PowerPoint; Interactive PowerPoint; Civic Education and Learning outcomes

larger society call for innovative integration (Harris, Mishra & Koehler, 2009). It is, however, important for teachers to acquire knowledge and skills that allow them to appropriate technologies for pedagogical purposes, “so that they can use Excel, for example, to help children organize and analyze data, and they can create podcasts as ways to share constructed knowledge with others” (Harris, Mishra & Koehler, 2009:399). When technology is used in this manner, the teacher becomes a mentor and facilitator of the teaching and learning process while learners are actively involved in the process of constructing knowledge (Jagtap, 2016; Garba, 2018).

One of the digital technologies that call for innovative integration in the teaching and learning process is PowerPoint. PowerPoint is primarily designed to enhance the presentation of multimedia content to the audience and it is highly embraced by the business world. The default PowerPoint presentation is known as a “slide show” where one slide precedes another as control by the presenter. The sheer popularity of PowerPoint as a presentation tool in education industry comes from the belief that representation of information using auditory and visual inputs improves learning (Gambari, Zubairu, Daramola, Abubkar, & Tukura, 2018; Gambari, 2017; Effiong & Ekpo 2016; Mayer, 2014; Garba, Singh Yusuf, Ziden, 2013;).

When PowerPoint is used as a tool for presenting multimedia content linearly to the targeted audience, it is technically term ‘linear PowerPoint’ because the user cannot easily navigate to any part of the presentation (Marcovitz, 2012). Linear PowerPoint presentations, however, have received a lot of criticisms

Suitability of linear PowerPoint presentation is nowadays questionable because multimedia learning packages that only appeal to auditory and visual senses of the learners are now considered inadequate except such package embedded interactivity.

The use of PowerPoint by stakeholders of the business world is more of linear presentations and they are comfortable with it based on the peculiarity of their targeted audience. Follow suit by the education industry means that the application will only extend passive learning digitally. However, passive learning is boring and easily evaporates compare to active learning where learners are actively engaged in knowledge construction through digital technologies (Waugh & Hoppe, 2014; Knobloch, 2009). For learning activities to be regarded as active learning, learners must be engaged visually, verbally, kinesthetically, socially and there is a means for real-time feedback (Knobloch, 2009). Linear PowerPoint presentation, however, is limited to visual and verbal representations of learning contents. It is high time, therefore, for the education industry to innovate better ways of using this most available, affordable and accessible computer application in line with the educational needs of 21st-century learners. This can be achieved by exploiting interactive features of PowerPoint application which are adequately enough in designing and packaging Interactive PowerPoint; a format of Interactive Multimedia learning. Interactive PowerPoint is an emerging Interactive Digital Technology (Garth, 2010) that has the potentiality of creating a 21st-century learning environment using the interactives features of PowerPoint



Fig. 1: Linear PowerPoint  
Source: Chen, (2012)

from different scholars in the education industry (Waugh & Hoppe, 2014).

applications such as hyperlinks, trigger, animation, custom shows, selection pane,

and animation pane among others. Interactive PowerPoint is a network of slide hyperlinked to one another which enable flexible navigation and user-friendly interaction (Kosslyn, Kievit, Russell, & Shephard, 2012; Garth, 2010; Poole, Jackson, & Randall; 2002). One of the unique advantages of Interactive PowerPoint is 'guided screen.' The interactive PowerPoint used the entire computer screen which prevents user(s) from using any other applications installed on the computer. This addressed the issue of "disruptiveness" most often reported as one of the disadvantages of integrating digital technology in the teaching and learning process (Blundell, Lee & Nykvist, 2016). Students can only have access to the activities programmed on Interactive PowerPoint in use.

Interactive PowerPoint is a new way of integrating PowerPoint in learning. It has been reported generically to have positive effects on learning outcomes (Effiong & Ekpo-eloma, 2016; Bahadur & Boodun 2013). However, less emphasis is paid to the metaphor upon which

PowerPoint is built support learners in connecting what they already know (the properties of the metaphor domain) with new material (the domain unto which the metaphor is being applied) (Marcovitz, 2012; Eppler, 2006). There are different metaphors upon which Interactive PowerPoint can be built. This includes but not limited to travel metaphor, book metaphor, map metaphor, research metaphor, game metaphor among others (Marcovitz, 2012). Game-based Interactive PowerPoint (GB-IPP) is an interactive PowerPoint built on the metaphor of game. In this mode of Interactive PowerPoint, the learners are provided with varying information that requires them to determine the relevance of the information at hand in executing virtual projects (Game). This model is in line with the constructivist model of learning where the knowledge acquired from information inbuilt in the package is to be used in executing the project at hand. Furthermore, the students are at liberty to determine the level of information they need among the

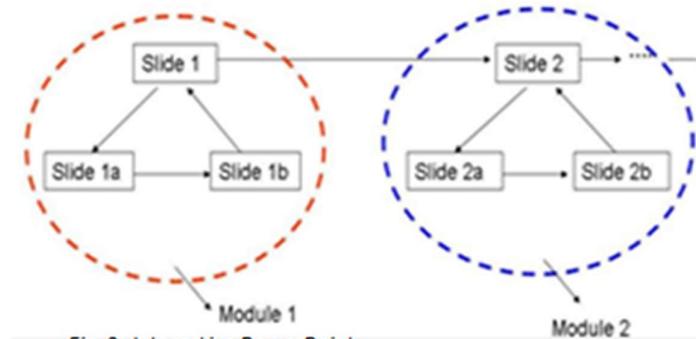


Fig. 2: Interactive PowerPoint  
 Source: Chen, (2012)

interactive PowerPoint is built. The chosen metaphor by teachers, however, determines the activities to be carried out by students while using digital information systems and this is the main determinant of learning outcomes (Ihlström & Westerlund, 2013; Ken & Mai 2002). "A metaphor is the way the user will think about the project" (Marcovitz, 2012:6). Metaphor upon which Interactive

information provided to successfully execute the virtual project.

The teachers in GB-IPP have the fundamental role of prompting students to see the need for information in addressing the problem at hand; the need to collaborate with fellow students in solving the problem; the need to think critically in distinguish between relevant and irrelevant information. Adherence to

this mode of technology integration simply means a deviation from common classroom practice of teacher-centred learning to that of uncompromised students centred learning where students are actively constructing knowledge rather than being a passive receiver. This deviation may have academic implications (positive or negative) on students' leaning outcomes in any school subject. However, the academic implications of integrating Interactive PowerPoints of Game metaphor in civic education as a school subject has not been empirically established. This study comes to bridge this gap by investigating the difference in the academic performance and attitudes of students taught civic education using Game-based Interactive PowerPoint and those taught using Linear PowerPoint.

Based on this, the study raised the following research questions:

1. What is the difference between the mean academic performance score of students taught civic education using Game-based Interactive PowerPoint and those taught using Linear PowerPoint?
2. What is the difference between a mean rating of SS2 students' attitudes toward learning civic education when taught using Game-based Interactive PowerPoint and those taught using Linear PowerPoint?

The following hypotheses were formulated and tested at 0.05 level of significance:

1. There is no significant difference between the mean performance scores of students taught civic

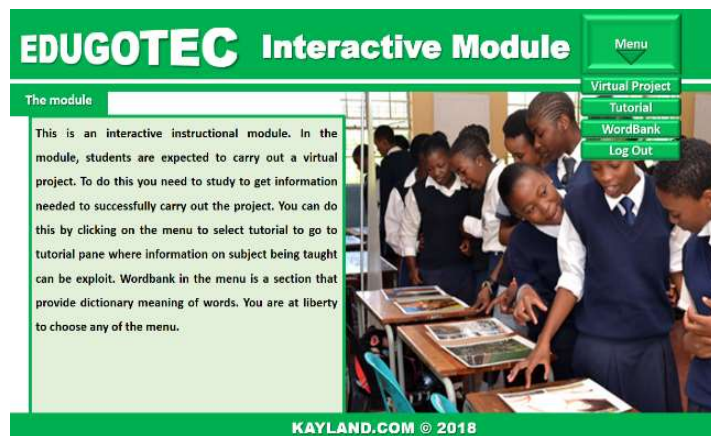


Fig. 3: Homepage of Game-based Interactive PowerPoint Package



Fig. 4: Virtual Project of Game-based Interactive PowerPoint Package



- education using Game-based Interactive PowerPoint and those taught using Linear PowerPoint.
2. There is no significant difference between the mean performance scores of students taught civic education using Game-based Interactive PowerPoint and those taught using Linear PowerPoint

## METHODOLOGY

The study adopted a quasi-experimental design. A quasi-experimental design is a research design in which participants are selected for different conditions from pre-existing groups who are of similar baseline and they are not created through manipulation of the researcher (White & Sabarwal, 2014). Specifically, pretest-posttest non-equivalent nonrandomized comparison groups design was used. The study has two treatment groups; group one was taught using Linear PowerPoint while group two was taught using Game-based Interactive PowerPoint instructional packages. The population of the study was 2,908 Senior Secondary two (SS2) students in the 39 senior secondary schools in Zaria Education Zone of Kaduna State, Nigeria. The study's sample size was 130 SS2 'A' students drawn purposively from two intact classes of two Senior Secondary schools in Zaria Education Zone of Kaduna State. The sample schools were selected based on having a functional computer classroom/lab that can serve an intact class when grouped into a group of 5-6 members (Game-based Interactive PowerPoint Group) and having a computer lab equipped with functional Projector and 60-70 seating capacities for students (Linear PowerPoint Group). Interactive PowerPoint Group is having an intact class of 66 SS2-A students while Linear PowerPoint group is having an intact class of 64 SS2 'A' students.

The treatment instrument used in this study were Game-based Interactive PowerPoint (GB-IPP) and Linear PowerPoint (LPP) instructional Packages.

The GB-IPP was designed using 'constructivist' principles while 'Dual Coding' principles guided the packaging of LPP. The LPP learning environment was a semi-compromised student-centred learning environment where the teacher played the role of presenter and arouse active participation of the learners via the multi-media content of the Linear PowerPoint Slides. GB-IPP class was a non-compromised student-centred learning environment where the teacher played the role of facilitator. The package used for GB-IPP group features multiple sources of information in different media format (text, image and video) and virtual project for knowledge application. The students in this group used the package at the group level of five members each. However, students are at liberty to determine the level of information they need among the information provided to successfully execute the virtual project (Gaming activities).

The study used two test instruments; Civic Education Performance Test (CEPT) (adopted from WAEC and NECO from 2014-2017), Civic Education Students Attitudinal Scale (CESAS). CEPT and CESAS were validated by experts in measurement and evaluation, social studies education and instructional technology. Their suggestions were used in improving the instruments. CESAS was pilot tested using Cronbach Alpha Approach and a reliability coefficient of 0.85 was obtained. CEPT is a 20 items multiple-choice questions on the taught civic education content (National Integration and Political apathy). Each of the correct answers attracted 2 marks while the wrong answer attracts zero marks. CESAS is an 18 items Likert scale of four points. By reversing the negatively stated items, the CESAS highest score is 72 (high positive attitude: 9-SA of positively worded items + 9-SD of negatively worded items) and the lowest score is 18 (high negative attitude; 9-SD of positively worded items and 9-SA of negatively worded items).





The study begins with pre-testing of reorganized and reworded CEPT and CESAS. This was followed by four weeks of teaching, 2 contacts of 40 minutes per week for each group using their designated PowerPoint packages. Civic education teachers in each of the schools presented/facilitated the lessons. Post-test was administered for each of the groups using the 5<sup>th</sup> week. Students attendances were taken during pretest, treatment administrations and post-test by the teacher in charge of each group. Therefore, the study used a criterion of full participation as a requirement for students' data (pre-test and post-test data) to be included in data analysis. The data collected was analyzed using descriptive and inferential statistics. Descriptive statistics of mean, standard

deviation and percentage were used in answering the study's research questions. Hypotheses 1 was tested using ANCOVA while hypothesis 2 was tested using Independent sample t-test. The difference in the statistical tool used was based on preliminary analysis of pre-test data which shows that there was a significant difference in the entering behaviours of students in CEPT and there was no significant difference in the entrance behaviours of students in CESAS.

## RESULTS

**Research Question One:** What is the difference between mean academic performance scores of students taught civic education using Game-based Interactive PowerPoint and those taught using Linear PowerPoint?

**Table1:** Mean difference between academic performance scores of students taught civic education using GB-IPP and LPP

Groups	N	Mean	Std. Deviation	Mean difference	% of Mean difference
GB-IPP	44	27.0	4.96499		
LPP	54	23.6	4.95514	3.4	12.6
<b>Total</b>	<b>98</b>	<b>25.10</b>	<b>5.22581</b>		

Table1 shows the mean difference between the academic performance scores of students taught civic education using Game-Base Interactive PowerPoint and those taught using Linear PowerPoint. The mean score of GB-IPP is 27.0 and that of LPP group is 23.6. The mean difference between the two groups is 3.4 that is, GB-IPP mean score is 12.6% better than that of LPP. This

shows that students in GB-IPP perform better than LPP.

**Research Question Two:** What is the difference between a mean rating of SS2 students' attitudes toward learning civic education when taught using Linear PowerPoint and those taught using Interactive PowerPoint?

**Table2:** Mean difference of students' attitudes toward civic education taught civic education using GB-IPP and LPP

Group	N	Mean	STD.	Mean difference	% of the Mean Difference
GB-IPP	44	59.77	4.09		
LPP	54	53.63	3.94	6.24	10.42
<b>Total</b>	<b>98</b>	<b>56.39</b>	<b>50.04</b>		

Table 2 shows the mean difference between the mean rating of SS2 students' attitude toward civic education as a school subject when taught using Game-Base Interactive PowerPoint and

those taught using Linear PowerPoint. The means score of the Interactive PowerPoint (GB-IPP) group (M=59.77) is 10.42% differs (different =6.24) from the mean rating of Linear PowerPoint (LPP) Group (M=53.63).



Using the mean benchmark drawn for decision making, students in GB-IPP group are of high positive attitude while the LPP group are of Low positive attitude.

**TESTING OF HYPOTHESES**

**Hypothesis One:** There is no significant difference between the mean

performance scores of students taught civic education using Game-based Interactive PowerPoint and those taught using Linear PowerPoint.

**Table 3:** ANCOVA Results of the Mean performance scores of SS2 students taught civic education using LPP and GB-IPP

Source	Type III Sum of Squares	df	Mean Square	F	P-value
Corrected Model	1358.638 <sup>a</sup>	2	679.319	50.014	.000
Intercept	433.268	1	433.268	31.899	.000
Pretest	1070.992	1	1070.992	78.851	.000
Group	115.120	1	115.120	8.476	.004**
Error	1290.341	95	13.583		
Total	64400.000	98			
Corrected Total	2648.980	97			

\*\*=Significant P<0.05

Table 3 shows the ANCOVA results of the academic performance of the students taught civic education using IPP and GB-IPP. From table 3, the F (1, 95) =8.476, p<0.05. This indicated that the difference in the mean scores of the two research groups is statistically significant in favour of GB-IPP. Thus, the null hypothesis that says; there is no significant difference in the mean performance

scores of SS2 students taught civic education using Game-based Interactive PowerPoint, and those taught using Linear PowerPoint is rejected.

**Hypothesis Two:** There is no significant difference between the mean rating of SS2 students' attitudes toward learning civic education when taught using Linear PowerPoint and those taught using Interactive PowerPoint.

**Table4:** Independent Sample t-test showing the difference in the mean rating of student's attitude toward civic education as a school subject when taught using GB-IPP and LPP

Group	N	Mean	Std. Dev	t.	Df	p-value
IPP	IPP	44	59.7727	7.542	96	.000
LPP	LPP	54	53.6296	7.511		

Table 4 shows that there is a significant difference between the mean rating of GB-IPP and LPP groups in Civic Education Student Attitudinal Scale (CESAS), (Crit.-t=7.542, Cal.t. 7.511, df = 96, p<0.05 in favour of GB-IPP. Thus, the hypothesis that says there is no significant difference between the mean rating of students' attitudes toward learning civic education when taught using Game-based Interactive PowerPoint and those taught using Linear PowerPoint is rejected.

**DISCUSSIONS**

The analyzed data on the effect of Game-based Interactive PowerPoint on student's attitudes and academic performance shows results that call for further discussion. Hypothesis one was to establish if there would be a statistically significant difference in the mean performance score of students taught civic education using Interactive PowerPoint featuring game and those taught without. This is to establish whether gaming activities on interactive PowerPoint affect students' academic performance. The

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results of the ANCOVA test indicated that there was a statistically significant difference ( $p=0.004$ ) between the mean achievement score of the students taught civic education using Game-based Interactive PowerPoint and linear PowerPoint. The finding of this study confirmed Giannakos (2013) who reported a positive effect of game-based learning on student's attitudes, enjoyment and academic achievement. This finding is contrary Ke (2008) who reported that game-based learning shows no correlation to improved student achievement in mathematic. This contradiction, however, may be linked to how gaming activities were integrated into the previous study's learning activities. The previous study is individualized game-based learning while the present study is a cooperative game-based learning. Furthermore, in the present study, the game was not used alone but integrated with a tutorial while the previous study is pure game-based learning. This shows that when the game is combined with tutorial activities and is played at the group level is capable of improving students' performance in civic education.

The study's second hypothesis was to establish if there would be a statistically significant difference between the mean rating of the attitude of students toward civic education when taught using Game-based Interactive PowerPoint and Linear PowerPoint. The results of Independent sample t-test indicated that there was a statistically significant difference ( $p=0.00$ ) between the two groups in favour of game-based Interactive PowerPoint group. This finding is in alignment with Falode, Ojoye, Ilobeneke, Falode (2016), Liu and Chen (2014), Gamabri, Gbodi, Olakanmi, Abalaka (2016) who reported positive effects of interactive instructional package on student's interest, attitude and motivation. This shows that game-based Interactive PowerPoint as a type of interact instructional packages is capable

of developing positive attitudes in students toward civic education.

## CONCLUSION

Inferring from the findings of this study, the study concluded that there are educational advantages of integrating digital technology of game-based Interactive PowerPoint in the teaching of civic education. Different from improving student academic performance it also develops high positive attitudes in students toward learning civic education. However, this study is limited to some selected topics in civic education (Political apathy and National Integration), the same result may not be found when other topics in civic education curriculum content are used. This call for further study that will examine the effects of game-based Interactive PowerPoint on topics not covered by this study. Furthermore, the study only compared game-based Interactive PowerPoint with Linear PowerPoint presentation, further studies that will include conventional chalk and talk method can be carried out.

## RECOMMENDATIONS

Inferring from the findings of this study, the study offers the following recommendations:

1. Civic education teachers should be encouraged to use Game-based Interactive PowerPoint (GB-IPP) in teaching civic education because is more effective than Linear PowerPoint instructional packages in improving student academic performance and development of high positive attitudes toward civic education as a school subject.
2. Concerned NGOs and Government bodies should sponsor hands-on-training on designing and integrating Game-based Interactive PowerPoint in teaching and learning processes. The training should feature pedagogical functionalities of digital technology and principles of





facilitating students centered learning environment.

## REFERENCES

- Bahadur, G. K. & Boodun, S. S. (2013). Using PowerPoint Presentations as a Tool for Effective Teaching and Learning of Water Science for Upper Primary Pupils in Mauritius. *The International Journal of Science, Mathematics and Technology Learning*. 19(2). 65-78. <http://thelearner.com/>
- Blundell, C., Lee, K-T., & Nykvist, S. (2016). Digital learning in schools: Conceptualizing the challenges and influences on teacher practice. *Journal of Information Technology Education: Research*, 15, 535-560. Retrieved from: <http://www.informingscience.org/>
- Chen, Y. (2012). Integrating anchored instructional strategy and modularity concept into Interactive multimedia PowerPoint presentation. *International Journal of the Physical Sciences*. 7(1).
- Driessnack, M. (2005). A closer look at PowerPoint™ Feature Article. *Journal of Nursing Education*, 44(8), 347
- Effiong A. A. & Ekpo, O. E. (2016). Interactive effect of PowerPoint instructional package and academic Performance of educational technology students in the University of Calabar. *Equatorial Journal of Education and Curriculum Studies*. 1(1)2
- Erdemir, N. (2009). Determining students' attitude towards physics through problem-solving strategy. *Asia-Pacific Forum on Science Learning and Teaching*, 10(2), Article-1.
- Falode, O. C., Ojoye, B. T., Ilobenke S. C., & Falode, M. E. (2016). Effectiveness of interactive hypermedia instructions when used alone and when combined with the lecture method on secondary school students' achievement and interest towards physics in Minna, Nigeria. *Nigerian Journal of Educational Technology*, 1(2).
- Gabriel, Y. (2008). Against the tyranny of PowerPoint: technology-in-use and technology abuse. *Gabriel. Org. Stu.*, 29(2): 255-276.
- Gambari A. I. (2017). *Digital Instructional Media in the 21<sup>st</sup> Century*. Nigeria: Impresmedia Printing and Publishing Co.
- Gambari, A. I., Zubairu, S. A., Daramola, F. O. Abubkar, H. A., & Tukura, C. S. (2018). Impact of Infographics on the academic performance of junior Secondary School Social Studies Students in Giwa Educational Division, Kaduna State, Nigeria. *Journal of Information, Education, Science and Technology*, 5(1). 157-167.
- Gambari, I. A, Gbodi, B. E., Olakanmi, E. U., Abalaka, Enejo. (2016). Promoting Intrinsic and Extrinsic Motivation among Chemistry Students using Computer-Assisted Instruction. *Contemporary Educational Technology*, 7(1), 25-46
- Gambari, I. A, Gbodi, B. E., Olakanmi, E. U., Abalaka, Enejo. (2016). Promoting Intrinsic and Extrinsic Motivation among Chemistry Students using Computer-Assisted Instruction. *Contemporary Educational Technology*, 7(1), 25-46
- Garba S. A, Singh T.K.R, Yusuf N.B.M., Ziden A.A. (2013). An Overview of Technology Integration in Nigerian Colleges. *Education Journal of Education and Learning*. 37 Vol. 7 (1) pp. 35-42
- Garba, S. A (2018). *The Use of the ASSIM Model for Technology Integration in Instructional Delivery by Faculty Members and Pre-Service Teachers*. Licensee IntechOpen <http://creativecommons.org/licenses/by/3.0>



- Garba, S. A., Byabazaire Y. & Busthami A. H. (2015). Toward the Use of 21st Century Teaching-Learning Approaches: The Trend of Development in Malaysian Schools within the Context of Asia Pacific. *International Journal of Education Technology (IJET)*, Volume 10(4).
- Garth, A. (2010). *Interactive PowerPoint: An Interactive Guide*. Sheffield Hallam University
- Giannakos, M. N. (2013). Enjoy and learn with educational games: Examining factors affecting learning performance. *Computers & Education*, 68, 429-439.
- Harris, J. B., Mishra, P., & Koehler, M. (2009). Teachers' technological pedagogical content knowledge and learning activity types: Curriculum-based technology integration reframed, *Journal of Research on Technology in Education*, 41(3), 393-416.
- Ihlström, J & Westerlund, K. (2015). *Interactive learning environments: The effects of interactivity in online learning environments*. Institutionen för Informatik. Retrieved from: <https://pdfs.semanticscholar.org/873767443.1577034302>.
- Jagtap, P. (2016). Teachers Role as Facilitator in Learning. *Scholarly Research Journal for humanity Science and English Language*, 3(17)
- Ke, F. (2008b). A case study of computer gaming for math: Engaged learning from gameplay? *Computer & Education*, 51, 1609-1620.
- Ken, N. T. K. & Mai, N. (2002). Interactive multimedia education: Using Authorware as an instructional tool to enhance teaching and learning in the Malaysian classroom. *Interactive Educational Multimedia*, 5(1), pp 80-94.
- Knobloch, N. (2009). *Learner-centred Teaching Approaches*. Retrieved from [www.ydae.purdue.edu/lct](http://www.ydae.purdue.edu/lct)
- Kosslyn, S. M., Kievit R. A. Russell, A. G. & Shephard, J. M. (2012). PowerPoint® presentation flaws and failures: a psychological analysis. *Frontiers in Psychology-Educational Psychology*, 3(230).
- Marcovitz, D. M. (2012). *Powerful PowerPoint for Educators: Using Visual Basic for Applications to Make PowerPoint Interactive*. (2<sup>nd</sup> Edition). California: Libraries Unlimited.
- Mayer R (2014) *The Cambridge Handbook of Multimedia Learning*, 2<sup>nd</sup> edition. New York: Cambridge University Press.
- Savoy, A, Proctor, R. W. & Salvendy, G. (2019). Information retention from PowerPoint™ and traditional lectures. *Computers & Education*. 52(2009) 858–867.
- Schell, G. P. & Janicki, T. J. (2013). Online Course Pedagogy and the Constructivist Learning Model. *Journal of the Southern Association for Information Systems*, 1(1), 26-36.
- Stein, K. (2006). The dos and don'ts of PowerPoint™ presentations. *Journal of the American Dietetic Association*, 106(11), 1745–1748
- White, H., & S. Sabarwal (2014). Quasi-experimental design and Methods, *Methodological Briefs: Impact Evaluation 8*, UNICEF Office of Research, Florence.
- Wofford, J. (2009). K-16 Computationally rich science education: A ten-year review of the Journal of Science Education and Technology (1998–2008). *Journal of Science Education Journal and Technology*, 18, 29–36.
- Yusuf, H. O., Maina, B., & Dare, M. O. (2013). Availability, Utilization and Management of ICT Facilities in teaching the English Language in Kaduna state, Nigeria. *Australian International Academic Centre PTY, Ltd*, 4(1).