



E-ISSN: 2789-1615
P-ISSN: 2789-1607
IJLE 2021; 1(1): 22-27
Received: 21-11-2020
Accepted: 25-12-2020

Evelyn Ehi Ajayi
Professor, Department of Art
and Social Sciences Education,
Benue State University,
Makurdi, Nigeria

Linus Iorember Zaria
Professor, Department of Art
and Social Sciences Education,
Benue State University,
Makurdi, Nigeria

Virginia Omada Alachi
Department of Art and Social
Sciences Education, Benue
State University, Makurdi,
Nigeria

Victor Oluwatosin Ajayi
PhD., Department of Art and
Social Sciences Education,
Benue State University,
Makurdi, Nigeria

Correspondence
Evelyn Ehi Ajayi
Professor, Department of Art
and Social Sciences Education,
Benue State University,
Makurdi, Nigeria

Improving upper basic students' critical thinking in social studies using PEDDA and IEPT instructional strategies

Evelyn Ehi Ajayi, Linus Iorember Zaria, Virginia Omada Alachi and Victor Oluwatosin Ajayi

Abstract

The study investigated if Prior-Conception, Exploration, Discussion, Dissatisfaction and Application (PEDDA) and Invitation, Exploration, Proposing-Explanation and Taking action (IEPT) instructional strategies could improve Upper Basic students' critical thinking in Social Studies. A sample of 173 students from 6 purposively selected secondary schools out of a population of 2,321 Upper Basic Education two (UBEII) students from Otukpo Local Government Area of Benue State, Nigeria was used for the study. The study adopted quasi experimental research design. The instruments used for data collection was Social Studies Critical thinking Ability Test (SSCTAT) with reliability value of 0.91 using Kuder-Richardson (KR-21) respectively. Two research questions and three null hypotheses guided the study. The research questions were answered using Mean and Standard Deviation while the hypotheses were tested using Analysis of Covariance (ANCOVA). The study revealed that there was significant difference in the mean critical thinking scores of students taught social studies using PEDDA, IEPT strategies and discussion method [$F_{2, 172}=411.100, P<0.05$]. It was found that there is no significant difference between the mean critical thinking of male and female students taught social studies using PEDDA and IEPT respectively [$F_{1, 55}=293.105, P>0.050$], [$F_{1, 58}=331.001, P>0.050$]. It was recommended among others that social studies teacher trainees should be trained on the use of PEDDA and IEPT and serving teachers should be encouraged to employ the use of PEDDA and IEPT to improve students' critical thinking in social studies.

Keywords: prior-conception, exploration, discussion, dissatisfaction and application (PEDDA), invitation, exploration, proposing-explanation and taking action (IEPT), and critical thinking

Introduction

Social Studies is the study of man and his environment. It is an integrated subject that deals with man's activities, his relationships and interactions with one another in his environment, and his knowledge of science and technology to solve the problems in his environment. Educational process that trains children without Social Studies will fail to provide all round development of the individuals, because Social Studies is a great force behind individual personality, moral and societal development. By implication, any nation that isolates or neglects Social Studies education stands the risk of becoming morally and socially bankrupt. Alachi (2017) ^[6] observe that repositioning Social Studies will help it to achieve its ultimate goal which is to produce the right calibre of students equipped with the right type of culture, values, attitudes and skills for national development.

Consequently, Social Studies teaching can only be result oriented when students are willing and the teachers are favourably disposed to using appropriate strategies and considering the fast speed of change and innovation in knowledge, being socially and mentally active learners, being learners who are aware of their own cognition and develop critical thinking seems necessary (Cihanoglu, 2012) ^[8]. Ajayi (2017) ^[2] lamented the inability of teachers to teach students in a manner and way the students will 'think outside the box' to be able to solve problem on their own. The author reiterated that thinking outside the box could enable learners cope with future challenges which could be in other areas of human endeavour. The author further stressed that teachers' appropriate use of instructional strategies could provide enabling environment for students to critically think well both in and outside the classroom. This assertion calls for the need to find innovative strategies such as Prior-Conception, Exploration, Discussion, Dissatisfaction and Application (PEDDA) and Invitation, Exploration, Proposing-Explanation and Taking action (IEPT) instructional strategies that

have the potentials to equip learners to critically think about their cognition, monitor their learning activities and evaluate the results of these activities.

Prior-Conception, Exploration, Discussion, Dissatisfaction and Application (PEDDA) strategy is a five-step conceptual change instructional strategy and it is from this step the acronym "PEDDA" is derived. PEDDA is an instructional strategy where learners construct their own knowledge by testing ideas based on prior conception, then explore an activity and are required to compare their new knowledge gained with their prior conception and applying these ideas to a new situation, thereby enhancing conceptual understanding. PEDDA takes cognizance of learners' prior knowledge before learning a new concept. This is aimed at learners' achieving the required social conception of such concept. PEDDA strategy also provides students the opportunity to interact with the teacher and also among themselves in the classroom (Ekon & Nwosu, 2016) ^[10]. This strategy focuses on linking students existing ideas and beliefs relevant to a situation and exploring the appropriateness of these ideas and beliefs (Rickey & Stacey, 2017) ^[14].

Invitation, Exploration, Proposing-Explanation and Taking action (IEPT) strategy is a four-step conceptual change instructional strategy and it is from this step the acronym "IEPT" is derived. IERT is an instructional strategy where students are engaged in constructing knowledge through reflecting on their prior knowledge, activities, discussion and taking action. In other words, this strategy arranges learning experiences through invitation, exploration, explanation and taking action so that students have the opportunity to construct their understanding of a concept. IEPT is a learner centered instructional strategy in which the learner plays active role in assimilating knowledge onto his or her existing mental framework. IEPT strategy is a form of strategy that encourages thoughtful reflection on experience. Canella (2011) opine that IEPT allow students to construct their own meaning by building on their previous knowledge and experience. By implication, new ideas and experiences are matched against existing knowledge and the learner constructs new or adapts rules to make sense of the world, thereby enhancing critical thinking. Critical thinking is the objective analysis and evaluation of an issue in order to form judgement.

Critical thinking is the ability to logically and rationally consider information. King, Goodson and Rohani (2013) ^[11] see critical thinking as the ability to think clearly and rationally about what to do or what to believe. It includes the ability to engage in reflective and independent thinking. Demirhan, Besoluk (2014) ^[9] observed that critical thinking enables students to acquire the necessary abilities to analyze information objectively and make a reasoned judgement which enhances performance. Good critical thinkers can draw reasonable conclusions from a set of information and discriminate between useful and less useful details to solve a problem or make a decision. Bloom (2015) observed that a critical thinker is able to deduce consequences from what he knows, and he knows how to make use of information to solve problems, and to seek relevant sources of information to inform him. Learners of social studies need critical thinking skills to evaluate and improve their creative ideas to make firm decisions. Moreover, Ajayi (2019) ^[4] opines that critical thinking may facilitate or debilitate students' academic success. This is because learners who possess high

critical thinking skills are likely to perform well in school due to their higher cognitive thinking capacity. Whereas, learners with low critical thinking may be reasonably thought to be prone to uncertainty, insecurity, anxiety and social distance which can affect their success in life generally.

Gender refers to the social attributes associated with being a male or female. Gender is an attribute that differentiates feminine from masculine socially. In this statement, gender is referred to one's sex; it becomes a factor in classroom instruction when the teacher creates a learning environment that favours either the boys or girls. This study seeks to investigate whether gender will influence the critical thinking of students in social studies if exposed to collaborative learning PEDDA and IEPT instructional strategies.

Purpose of the Study

The purpose of this study was to investigate if Prior-Conception, Exploration, Discussion, Dissatisfaction and Application (PEDDA) and Invitation, Exploration, Proposing-Explanation and Taking action (IEPT) instructional strategies could improve Upper Basic students' critical thinking in social studies in Otukpo Local Government Area of Benue State, Nigeria. Specifically, the study seeks to:

1. Determine the effectiveness of PEDDA, IEPT strategies and discussion method on students' critical thinking in Social Studies.
2. Ascertain whether the use of PEDDA would improve male and female students' critical thinking in Social Studies.
3. Determine whether the use of IEPT would improve male and female students' critical thinking in Social Studies.

Research Questions

The following research questions guided the study:

1. What are the mean critical thinking scores of students taught Social Studies using Prior-Conception, Exploration, Discussion, Dissatisfaction and Application (PEDDA), Invitation, Exploration, Proposing-Explanation and Taking action (IEPT) strategies and discussion method?
2. What are the mean critical thinking scores of male and female students taught Social Studies using PEDDA and IEPT?

Hypotheses

The following null hypotheses were tested

3. There is no significant difference in the mean critical thinking scores of students taught Social Studies using Prior-Conception, Exploration, Discussion, Dissatisfaction and Application (PEDDA), Invitation, Exploration, Proposing-Explanation and Taking action (IEPT) and discussion method.
4. The difference in the mean critical thinking scores of male and female students taught Social Studies using PEDDA is not significant.
5. There is no significant difference between the mean critical thinking scores of male and female students taught Social Studies using IEPT

Research Design and Procedure

The study adopted a quasi-experimental non-randomized pre-test, post-test control group design. This design was adopted because it was not possible to have complete randomization of the subject as this will disrupt school organization. The main thrust of the experimental design is to establish cause-and-effect relationship. Hence intact classes were randomly assigned to experimental and control groups. Specifically, the study focused on only Upper Basic Education 2 (UBE 2) students offering Social Studies, because this class is relatively stable compared to Upper Basic Education One (UBE 1) and Upper Basic Education Three (UBE 3). The study covers six sub-topics under Social Studies which include physical environment, science and technology, leadership, educational institutions, development and societal changes over time selected from the UBE 2 scheme of work. The study area was restricted to Otukpo Local Government of Benue State, Nigeria.

The study area was Otukpo Local Government Area (LGA) of Benue State, Nigeria. The population for this study comprised all Upper Basic Education two (UBEII) students offering social studies numbering 2,321 from all the 77 approved Upper Basic Education Schools in Otukpo Local Government Area (Benue State Teaching Service Board, Statistics Unit, 2020). The sample of this study was made up of 173 Upper Basic Education two (UBEII) students comprising 91 boys and 82 girls that were purposively drawn from 6 schools in Otukpo Local Government Areas of Benue State. These schools were selected based on the following conditions: government grant-aided; co-educational; social studies teachers with a minimum qualification of NCE in Social Studies Education with at least three years of teaching experience; and where the school authorities permitted the carrying out of the experiment.

One instrument known as Social Studies Critical thinking Ability Test (SSCTAT) was adopted for this study. SSCTAT was adopted from Schraw and Dennison (2012)^[15]. Critical Thinking Ability Test which is based on recognizing assumptions, evaluating arguments and drawing conclusion. Critical thinking test is a 25-item test made of short statements and conclusions. Students are to read through the statements carefully and come out with definite conclusions. SSCTAT and instructional packages (lesson

plans) were face validated by presenting them to three experts in Social Studies Education and one expert in Measurement and Evaluation in the Department of Art and Social Science Education, Benue State University, Makurdi. The items were scrutinized by these experts. Corrections and suggestions arising from these experts were used to review the Social Studies Critical thinking Ability Test and the instructional packages. SSCTAT upon validation was trial-tested to establish the reliability of the instrument. Kuder-Richardson (KR-21) formula was used to test internal consistency of SSCTAT which gave reliability value of 0.91.

One intact class from each of the six sampled schools was selected using simple random sampling. The classes were assigned randomly to experimental group I, experimental group II, and control group. The experimental group I comprised two intact classes; experimental group II comprised two intact classes while the control group also comprised two intact classes. Social Studies Critical thinking Ability Test (SSCTAT) was administered as pre-test to the intact classes. This lasted for one week before teaching commenced. During lessons, the experimental group I were taught Social Studies using PEDDA and the experimental group II were taught using IEPT in line with lessons procedure prepared by the researcher. The control group was taught the same Social Studies topics using the conventional discussion lesson notes. After six weeks of 12 periods of teaching, the same test instruments were administered as post-test though reshuffled. Mean and Standard Deviation Scores of the collected data were used to answer the research questions while the null hypotheses were tested at 0.05 level of significance using Analysis of Covariance (ANCOVA).

Results

Presentations in this section are based on research questions and null hypotheses

Research Question One

What are the mean critical thinking scores of students taught Social Studies using PEDDA, IEPT strategies and discussion method?

The answer to research question one is contained on Table 1.

Table 1: Mean Critical Thinking and Standard Deviation Scores of Students taught Social Studies using PEDDA, IEPT and DM

Group	N	Pre-Test		Post-Test		Mean Gain within Group
		<i>x</i>	<i>δ</i>	<i>x</i>	<i>δ</i>	
PEDDA	56	10.77	0.82	22.79	1.72	12.02
Discussion	58	10.79	0.93	14.27	1.29	3.48
Mean diff. between Groups		-0.02		8.52		8.54
IEPT	59	10.76	0.83	21.53	1.64	10.77
Discussion	58	10.79	0.93	14.27	1.29	3.48
Mean diff. between Groups		-0.03		7.26		7.29
PEDDA	56	10.77	0.82	22.79	1.72	12.02
IEPT	59	10.76	0.83	21.53	1.64	10.77
Mean diff. between Groups		0.01		1.26		1.25

Table 1 reveals the mean critical thinking and standard deviation scores of students taught Social Studies using PEDDA, IEPT and discussion method (DM) on a paired comparative basis. The data in table 1 show that the overall mean difference between students in PEDDA and DM groups was 8.54 in favour of PEDDA. This implies that

students in PEDDA group had higher critical thinking than students in DM group. Similarly, the overall mean difference between students in IEPT and DM groups was 7.29 in favour of IEPT. This implies that students in IEPT group had higher critical thinking than those in DM group. In the same vein, the overall mean difference between

students in PEDDA and IEPT groups was 1.25. This difference though small is in favour of PEDDA. This implies that students in PEDDA group had slightly higher critical thinking scores than their counterparts in IEPT group.

Research Question Two

What are the mean critical thinking scores of male and female students taught Social Studies using PEDDA and IEPT? The answer to research question two is presented on Table 2.

Table 2: Mean Critical Thinking and Standard Deviation Scores of Male and Female Students taught Social Studies using PEDDA and IEPT

Group	Gender	N	Pre-Test		Post-Test		Mean Gain within Gender
			<i>x</i>	<i>δ</i>	<i>x</i>	<i>δ</i>	
PEDDA	Male	30	8.32	0.79	22.92	1.23	14.60
	Female	26	8.27	0.84	22.01	1.19	13.74
Mean diff. between Gender			0.05		0.91 [^]		0.86
IEPT	Male	31	8.11	0.82	23.65	1.49	15.54
	Female	28	8.09	0.81	22.90	1.21	14.81
Mean diff. between Gender			0.02		0.75		0.73

Table 2 reveals the mean critical thinking and standard deviation scores of male and female students taught Social Studies using PEDDA and IEPT on a paired comparative basis. The data in table 4 show that the overall mean difference of both sexes taught Social Studies using PEDDA was 0.86. This difference though small is in favour of the male students. This implies that male students had slightly higher critical thinking than their female counterparts using PEDDA. In the same vein, the overall mean difference of both sexes taught Social Studies using IEPT was 0.73. This

difference though small is in favour of the male students. This implies that male students had slightly higher critical thinking than their female counterparts taught Social Studies using IEPT.

Hypothesis One

There is no significant difference in the mean critical thinking scores of students taught Social Studies using PEDDA, IEPT strategies and discussion method.

The answer to hypothesis one is presented on Table 3.

Table 3: ANCOVA Result for Mean Critical Thinking Scores of Students taught Social Studies using PEDDA, IEPT and DM

Source	Type III sum of square	df	Mean Square	F	Sig.	Partial Squared
Corrected model	1909.001	3	422.009	195.021	.000	0.76
Intercept	1490.000	1	1490.000	187.001	.000	0.05
TPrCTAT	286.001	1	286.001	89.009	.000	0.60
Group	1580.925	2	1580.925	378.000	.000	0.43
Error	789.290	167	13.890			
Total	100998.099	173				
Corrected Total	3708.490	172				

a. R squared = .074 (Adjusted R Squared= .101)

Table 3 presents the ANCOVA result for mean critical thinking scores of students taught Social Studies using PEDDA, IEPT and DM. The data in table 3 reveal that the observed mean difference in the critical thinking scores among the groups was significant [$F_{2, 172}=378.000, P<0.05$]. Hence, the null hypothesis that there is no significant difference in the mean critical thinking scores of students taught Social Studies using PEDDA, IEPT and DM was rejected. This implies that there is a significant difference in the mean critical thinking scores among the groups.

using PEDDA, IEPT and DM. The results reveal that the mean difference (I-J) between PEDDA and DM is 7.778* and this is significant at $p<0.05$. This implies that there is a significant difference in the mean critical thinking scores between the students taught Social Studies using PEDDA and those taught using DM in favour of PEDDA. Likewise, the results reveal that the mean difference (I-J) between IEPT and DM is 8.878* and this is significant at $p<0.05$. This implies that there is a significant difference in the mean critical thinking scores between the students taught Social Studies using IEPT and those taught using DM in favour of IEPT. However, the paired comparison of IEPT and PEDDA showed a Mean difference of 1.100 and this is not significant at $p>0.05$. This indicates no significant difference in the mean critical thinking scores between students taught using PEDDA and IEPT.

Table 4: Tukey HSD Post Hoc Comparison for Mean Critical Thinking Scores of Students' taught Social Studies using PEDDA, IEPT and DM

(I)	(J)	Mean Difference (I-J)	Std. Error	Sign.
Group	Group			
PEDDA	DM	7.778*	3.89	.000
IEPT	DM	8.878*	3.64	.000
IEPT	PEDDA	1.100	3.38	.237

Table 4 shows Tukey HSD post-hoc comparison for mean critical thinking scores of students' taught Social Studies

Hypothesis Two

The difference in the mean critical thinking scores of male and female students taught Social Studies using PEDDA is not significant

The answer to hypothesis five is presented on Table 5.

Table 5: ANCOVA Result for Mean Critical Thinking Scores of Male and Female Students taught Social Studies using PEDDA

Source	Type III sum of square	df	Mean Square	F	Sig
Corrected model	2690.312	2	355.093	235.029	.000
Intercept	1900.001	1	1900.001	502.001	.000
TPrCTAT	125.009	1	125.009	76.008	.000
Gender	1996.028	1	1996.028	220.003	.173
Error	898.001	53	37.919		
Total	219903.000	56			
Corrected Total	1209.791	55			

a. R squared = .376 (Adjusted R Squared= .323)

ANCOVA Test result in Table 5 reveals that there is no significant difference between the mean critical thinking of male and female students taught Social Studies using PEDDA [$F_{1, 55} = 220.003, P > 0.050$]. The null hypothesis is therefore not rejected. This means that PEDDA improved both male and female students' critical thinking in social studies.

Hypothesis Three

There is no significant difference between the mean critical thinking scores of male and female students taught Social Studies using IEPT

The answer to hypothesis three is presented on Table 6.

Table 6: ANCOVA Result for Mean Critical Thinking Scores of Male and Female Students taught Social Studies using IEPT

Source	Type III sum of square	df	Mean Square	F	Sig
Corrected model	1700.001	2	387.000	155.001	.000
Intercept	1520.020	1	1520.020	272.972	.000
TPrCTAT	206.009	1	206.009	94.034	.000
Gender	2910.100	1	2910.100	199.070	.139
Error	238.001	56	17.980		
Total	100998.099	59			
Corrected Total	3708.490	58			

a. R squared = .174 (Adjusted R Squared= .131)

ANCOVA Test result in Table 6 reveals that there is no significant difference between the mean critical thinking of male and female students taught Social Studies using IEPT [$F_{1, 58} = 199.070, P > 0.050$]. The null hypothesis is therefore not rejected. This means that IEPT improved both male and female students' critical thinking in Social Studies.

Discussion

The findings of this study revealed that students taught Social Studies using Prior-Conception, Exploration, Discussion, Dissatisfaction and Application (PEDDA) had higher critical thinking than their counterparts taught using discussion method. This finding agrees with Nduji, Okechukwu and Kemi (2019) [12] who revealed that PEDDA improve students' achievement in energy and society than lecture method. The likely explanation for this outcome may be connected to the fact that PEDDA fosters students' inquiry and challenge preconceptions that students bring to the classroom when compared to discussion method. Furthermore, this study revealed that students taught Social Studies using Invitation, Exploration, Proposing explanation, Taking action (IEPT) had higher critical thinking than their counterparts taught using discussion method. The finding is in agreement with Adeosun and Mobolaji (2018) [1] who revealed that the use of IEPT was a strong tool for improving students' learning outcomes in social studies than with traditional method of instructional delivery. The likely explanation for this outcome may be connected to the fact that IEPT exposed the students to active student participation in the learning process through exploration and problem solving when compared to discussion method

Another major finding in this study was that male students had slightly higher critical thinking than their female

counterparts using Prior-Conception, Exploration, Discussion, Dissatisfaction and Application (PEDDA) and Invitation, Exploration, Proposing explanation, Taking action (IEPT) respectively but ANCOVA test shows that the difference was no significant. This finding agrees with the findings of Ogbonna (2015) [13] who found that there was no significant difference between the achievement of male and female students in Physics practical using PEDDA. However, the finding contradicts the finding of Ajayi, Achor and Otor (2020) [5] who found gender disparity in students' achievement in favour of female in organic chemistry using conceptual change strategy. Based on this finding, critical thinking in Social Studies is therefore not dependent on gender. This means that the age long disparity in Social Studies critical thinking between male and female students could be consistence with the use of PEDDA and IEPT strategies respectively.

Conclusion and Recommendation

It is evident from the findings of this study that the use of Prior-Conception, Exploration, Discussion, Dissatisfaction and Application (PEDDA), Invitation, Exploration, Proposing-Explanation and Taking action (IEPT) strategies improved students' critical thinking in Social Studies than the use of discussion method. No gender disparity exists in the critical thinking of male and female students taught Social Studies using PEDDA and IEPT respectively. This implies that PEDDA and IEPT respectively are very rewarding to students' in-terms of improving students' critical thinking regardless of gender.

Based on the conclusion, the following recommendations are made:

1. Social Studies teacher's trainee should be trained on the application of Prior-Conception, Exploration,

- Discussion, Dissatisfaction and Application (PEDDA) and Invitation, Exploration, Proposing-Explanation and Taking action (IEPT).
2. Serving teachers should employ the use of PEDDA and IEPT to improve both male and female students' critical thinking in Social Studies.
 3. Ministry of Education and professional bodies such as Social Studies Association of Nigeria (SoSAN) should organize conferences or seminars and workshops to popularize and sensitize Social Studies teachers on the integration of PEDDA and IEPT in teaching Social Studies concepts.

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