Effect of Reciprocal Peer Tutoring on Upper Basic Students' Academic Achievement in Mathematics in Public Secondary Schools in Akwa Ibom State

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Abstract

This study investigated the Effect of Reciprocal Peer Tutoring (RPT) instructional strategy on students' academic achievement in Mathematics at the Upper Basic 2 school level. The study which adopted quasi-experimental, pretest posttest non-equivalent control group research design was carried out in Akwa Ibom State of Nigeria. Two research questions and two hypotheses guided the study. A sample of 83 Upper Basic 2 students drawn from a population of 63,344 using purposive sampling technique. One intact class was used in each of the three sampled schools which were assigned into two experimental groups and one control group. Data were collected using a 41-multiple choice instrument titled: "Basic Mathematics Achievement Test (BMAT)". The instrument developed by the researcher was subjected to face and content validation by three experts. The instrument was tested for reliability and was subjected to analysis using Kuder Richardson (K-R_{20}) formula to determine the internal consistency which yielded an index of 0.81. Before and after the treatment that lasted for six weeks, the BMAT was administered to the students by their regular Mathematics teachers. Data were analyzed using mean and standard deviation to answer the research questions, while Analysis of Covariance (ANCOVA) was used to test the null-hypotheses at 0.05 level of significance. Results indicated among others that using RPT instructional strategy brought about enhanced mathematics achievement in Upper Basic 2 students across gender. It was therefore, recommended among others that, Mathematics teachers should use Reciprocal Peer tutoring strategy more regularly in teaching Mathematics in order to enhance the achievement and learning retention of students.

Keywords: ***Reciprocal Peer Tutoring, Conventional Lecture Method, Academic Achievement.***

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Introduction

Mathematics is a subject most students run away from yet, it remains a core subject that remains *epicentric* in the conduct of businesses on a day-to- day basis in Nigeria. It therefore, deserves good efforts on the part of all categories of teachers and/or instructors who are the drivers of the curriculum. Despite the all-important place mathematics occupies and role it plays in our routine life activities, examination bodies have consistently reported students' poor performance in external examinations as indicated in the West African Examinations Council (WAEC) Chief Examiners' Reports for 2016, 2017, 2018, 2019, 2020, 2021 and 2022 consistently reported candidates' lack of skill in answering questions that were asked, inability to identify the principles or concepts to be used in solving a problem, poor interpretation of questions, inability to apply mathematical principles correctly, omission of units and failure to state/give answers in monetary value, as required as well as inadequate knowledge of financial mathematics, and so on.

The unabated persistent high failure rates in mathematics has always been blamed on teacher-factors most importantly, teaching methods or instructional strategies which persistently favours the Conventional Lecture Method (CLM) which is the oldest of the methods (Zawadi, 2020). Generally, teaching methods are classified into two broad groups namely; conventional/traditional and innovative methods or invariably as teacher-centered and learner-centered teaching strategies respectively (Zawadi, 2020; Eche, 2018; Wikipedia, 2019).

As an age-long method of instruction, a lot have been said and researched about CLM, its merits and demerits. For instance, Isah (2018) and Eche (2018), variously reported that lecture method can promote meaningful learning if properly used in the classroom. However, some authors such as James and Usman (in Isah, 2018) on the contrary, opined that lecture method is not capable of provoking or enhancing effective learning as it is incapable of addressing special needs of individual learners. Since how we teach is as important as how we learn, it becomes imperative that teachers should strive to adopt innovative instructional strategies that can guarantee interactivity and collaboration among learners. It is on this premise that the present study seeks to examine the effect of a choice innovative instructional strategy - Reciprocal Peer

Tutoring (RPT) on the academic achievement of Upper Basic 2 students in mathematics using Conventional Lecture Method (CLM) as a control variable.

Reciprocal Peer Tutoring (RPT) is one of the types of Peer tutoring instructional strategies in which pupils are allowed to play the role of tutor/teacher and that of the tutee/learner in alternate fashion along the course of teaching-learning process. According to Luzale (2012), RPT focuses on possible derivable benefits that each pupil stands to achieve as he/she prepares to teach one another. It is reciprocal because pupils assume both positions of tutor/teacher and tutee/learner in alternate form within a teaching-learning encounter. Based on the guidance and supervision of the regular class teacher, a well-planned peer tutoring session provides pupils with timely feedback, and to the teacher, critical information on the quality of teaching exhibited. Ojo (2019) sees RPT as a learner-centered instructional method in which students of the same class and possibly, age bracket alternate between the role of teacher/tutor and that of learner/tutee following a well-structured paradigm that enables team members to make progress in cognitive and/or academic achievement and retention.

In RPT, students exchange roles during the teaching-learning sessions, the students in turn teach and acquire assistance from peers, while the teacher in observer's status serves only as a guide as against participating at any stage of the instructional intervention. In the process the students go into dialogue among themselves as each learner interacts with one another. RPT expects every member of the group to contribute to the achievement of the objectives, and makes sure that only one person cannot be held accountable for the accomplishment of set goals (Esteve, 2005). Functioning as peer teachers has the tendency to increase the self-esteem, self-motivation and competence of these students, re-igniting their interest in learning and commitment to education (Bruce, 2012).

Academic achievement is a generic concept, having different forms including academic, which is the Crux of this study. It simply refers to what pupils were able to learn in a pre- specified period of time. It tries to measure the amount of academic content a pupil could learn within a given time period. This is normally measured through achievement test, continuous assessment or examination (Wikipedia, 2021).

Gender is a social construct, a social-cultural determinant the meaning and attributes of which vary from place to place, and from culture to culture (society to society).considered a vital factor in the teaching and learning process. According to Etubon and Udoh (2018), gender could pose

a hindrance to high achievement and retention among learners. Mari (2019) reported that a significant gender difference in students' performance in science exists.

Evidence over the years constantly indicated that in spite of all these plans and provisions, students' performance in mathematics in both internal and external examinations conducted by the three Examination Bodies namely; the West African Examination Council (WAEC), the National Examination Council (NECO) as well as the Joint Admission and Matriculation Board (JAMB) has continued to be on the decline. Mathematics teachers as critical stakeholders, are not left out of the quest for performance improvement. To this end, a teacher's interest could be establishing or determining if the poor academic performance of students in mathematics is as a result of teaching method or strategy used by teachers. It is on this premise that the researcher in this present study decided to investigate the comparative effectiveness of two instructional strategies in mathematics achievement and retention of Basic 2 students in Akwa Ibom State.

No doubt, Mathematics plays a significant vital role in the age-long global quest for scientific and technological advancement. To this effect, mathematics teachers are expected to have a good level of pedagogic competence and mastery of the subject in order to enhance students' academic achievement and retention. However, there are a lot of documented evidences pointing to the dwindling student performance in mathematics at both internal and external examinations. This situation had often been traced to teacher's instructional delivery methods copiously characterized by predominant use of teacher-centred instructional approaches, and nonuse of innovative teaching methods particularly, in the presence of ever increasing class size. Under CLM classroom condition, sstudents are reduced to mere passive listeners in mathematics classes and are consequently denied the opportunity to internalize, easily recall and transfer what is learned to new situations.

This study is anchored on Socio-cultural theory by Lev Vygotsky (1978), which states that children learn concepts and practices that are relevant culturally as they perceive and partake in the day-to-day lives of their communities and families. Vygotsky proposed an involvement mode of learning where the incorporation of knowledge is effected through social interaction of individuals. To Vygotsky all higher mental functions/operations have social origins, they initially occur in communications between people before they are internalized. Vygotsky (1978) argues that children learn concepts and practices that are relevant culturally as they perceive and partake in the day-to-day lives of their communities and families.

In a study by Bakare and Chibueze (2018) on the effect of reciprocal peer tutoring and direct learning environment on sophomores' academic achievement in electronic and computer fundamentals in Nigeria. Four research questions and four null hypotheses guided the study using quasi-experimental pretest posttest non randomized control group design. Mean and standard deviation were used to answer the research questions while, Analysis of Variance (ANOVA) was used to test the null hypotheses at 0.05 confidence limit. Results indicated that students in the experimental group who were taught mathematics using RPT performed better than their counterparts in the control group who were taught with the traditional lecture method.

Thompson (1999) Conducted a study on "The effectiveness of Peer tutoring on mathematics achievement of 5th grade students" two null hypothesis guided the study. The study was of quasi-experimental design consisting of students in two fifth grade classrooms. 23 students from each class given a sample of 46 students was studied. The student's t-test was used to analyze data. Results indicated no significant mean difference existing between the group taught using peer tutoring and those taught using traditional method.

Adedeji (2013) studied the effects of Peer tutoring and explicit instructional strategies in primary school pupils learning outcome in mathematics. Seven (7) null hypotheses guided the study was based on quasi-experimental, pre-test post-test, control group using a 3x3x2 factorial design. A sample of 170 primary five pupils selected through random sampling was used for the study. Data were analyzed using statistical tool of Analysis of Covariance (ANCOVA). Findings indicated that there was a significant interaction effect of treatment and pupil's ability towards mathematics. These findings and applications indicated that the significant mean effect of treatment on mathematics achievement and attitude respectively provide empirical basis to suggest that primary school teachers should regularly use peer tutoring and explicit teaching instructional strategies in mathematics classrooms.

Campolo, Thielman and Packel (2013) conducted a study on "Evaluation of Peer Teaching across the Curriculum: student perspectives" in Philadelphia United States of America. The purpose of the study was to assess the outcomes of near-peer teaching initiatives from both learners' and teachers' perspectives. The study adopted a mixed method/design approach that included a quantitative survey and a qualitative focus group. Findings of this study indicated that the overwhelming majority (95.6%) of the near-peer learners perceived near-peer tutoring (NPT) as a valuable and effective approach to learning in anatomy class.

Bakare and Chibueze (2018) studied the effect of RPT and direct learning environment on sophomore's academic achievement in electronic and computer fundamentals in Nigeria. The study was a quasi-experimental design using intact classes. Sample of the study was 107 first year degree students selected from two public universities. Data was collected using two instruments called electronic and computer fundamentals achievement test (ECFAT) and electronic and computer fundamentals interest inventory (ECFII). Data were analyzed using analysis of covariance (ANCOVA). Results indicates that reciprocal peer tutoring is more effective than the direct learning environment in improving sophomore's achievement in electronic and computer fundamentals. Results further revealed that gender had effect on students' achievement and learning retention in electronic and computer fundamentals.

Amidi, Charles and Obumneke-Okeke (2020) investigated "The effect of reciprocal peer tutoring on reading achievement of primary school pupils in Awka Metropolis of Anambra State". Three research questions and two null hypotheses guided the study. The population of the study was 3419 primary School pupils out of which 65 pupils were purposefully sampled from schools that use Macmillan English textbook. The design of the study was quasi-experimental, pre-test, post-test control model. Data was collected using Reading Achievement Test (RAT) with a reliability coefficient of 0.89 on Kuder- Richardson formula 20 (KR-20). Data was analyzed using mean and standard deviation, while Analysis of Covariance (ANCOVA) was used for testing the null hypotheses. Results indicates that pupils in the experimental group (Reciprocal Peer Tutoring) performed better than those in the control group (Lecture Method).

Research Objectives

The study is addressed the following specific objectives to:

1. determine the mean achievement score of students who are taught mathematics using Reciprocal Peer Tutoring (RPT) instructional strategy and those taught using Conventional Lecture Method (CLM).
2. determine the achievement scores of male and female students who were taught Mathematics using Reciprocal Peer Tutoring (RPT) instructional strategy.

Research Questions

The following research questions were posed to guide the study:

1. What is the difference in the mean academic achievement scores of Upper Basic 2 students taught Mathematics using Reciprocal Peer Tutoring (RPT) instructional strategy and Conventional Lecture Method (CLM)?
2. What is the difference between the mean academic achievement scores of male and female Upper Basic 2 students' when taught Mathematics using Reciprocal Peer Tutoring (RPT) instructional strategy?

Hypotheses

The following null hypotheses were formulated to guide the study and were tested at 0.05 alpha level:

H01: There is no significant difference in the mean achievement scores of Upper Basic 2 students
who were taught mathematics using Reciprocal Peer Tutoring (RPT) instructional strategy, and those taught using Conventional Lecture Method (CLM).

H02: There is no significant difference between the posttest (achievement) scores of male and female Upper Basic 2 students who were taught Mathematics using Reciprocal Peer Tutoring (RPT)instructional strategy.

Design of the Study

The design of this study is quasi-experimental pre-test, post-test non randomized control group design using 2 x 2 x 2 matrix. Quasi-experimental pre-test post-test non randomized control group design was considered for this study because it is primarily concerned with the examination of causal relationships between and among variables particularly, when the experimental subjects are not randomly assigned to the groups (European Scientific Research and Population, 2018). Since the intent of the present study is to determine the effect of Reciprocal Peer Tutoring on students' Achievement and Retention in Mathematics in Public Secondary Schools in Akwa Ibom State of Nigeria using intact classes (nonuse of randomized samples, quasi-experimental, pre-test, posttest, non-randomized control group) design is

therefore deemed suitable and appropriate for this present study. The study involved two (2) groups made up of one (1) treatment group herein referred to as "A" " and one control group denoted as "C". Group A is the Experimental Group 1 assigned to RPT as an instructional method. Group C is the Control group and consequently assigned to Conventional Lecture Method of instruction.

Table 3.1 Pre-test post-test test control group design Layout.

Pre-test		Post-test
01	X1	02
05	-XC	06

Where:

X1 = Treatment (subjects exposed to Reciprocal Peer tutoring strategy)

C = No Treatment Control (subjects exposed to CLM)

The population of this study is 63,344 made up of 29,578 males and 33,766 females Upper Basic 2 students (State Secondary Education Board SEMB, 2023) in the 243 secondary schools spread across the 25 local government areas of the State. Upper Basic 2 students were chosen for the study basically because they are not sitting for any external examinations. The choice is also consequent upon the assumption that having gone through Upper Basic 1 syllabus or scheme of work, the students have had a good entry behavior into Upper Basic 2 mathematics scheme of work. This so because while Upper Basic 3 students are facing external examination, Upper Basic I students have yet to be sufficiently exposed to the basic mathematics to be suitably qualified for this study.

The sample of the study is 83 students. Reciprocal Peer Tutoring (RPT) instructional strategy Experimental Group A was assigned to Christian Comprehensive Secondary School Ikot Abia Osom with 42 students (made up of 22 males and 20 females), while the Control Group B was assigned to Comprehensive High School Ikpe Mbak Eyop with 41 students (made up of 19 males and 22 females). The purposive sampling technique was used to select schools that have common characteristics with reference to qualified and experience Basic mathematics teachers, intact classes and mixed gender (or co-educational) schools all within proximal locations.

Further, the classes were purposively assigned to groups, the treatment and control groups without any priori considerations. This is because the classes were intact classes.

The instrument used for data collection in this study is a researcher-developed 46-item Basic Mathematics Achievement Test (BMAT) which was developed to determine the students' achievement in Basic Mathematics on the topics covered within the experimental scope. The BMAT was again restructured by further reshuffling of the items. The researcher assigned lesson topics from Upper Basic 2 Mathematics Curriculum (Scheme of Work) to each subunit such that each subunit had the following lessons 18 lesson plans on mathematics that covered the above selected topics.

The BMAT was subjected to both content and face validation by three (3) experts made up of; one mathematics lecturer, one lecturer in Educational Measurement and Evaluation and one lecturer from Curriculum and Instructional Studies, all from College of Education, Michael Okpara University of Agriculture Umudike. Also. One (1) seasoned senior secondary school mathematics teacher in Akwa Ibom State School system whose input was considered critical as the implementer of the mathematics curriculum was solicited to add value. The test items (or questions) were subjected to item analysis to ascertain the adequacy and suitability of each item with specific reference to difficulty discrimination and distractive indices. At the end 41 out of 45 items were selected. The total variance was determined as 38.73 and reliability was determined as 0.89 on Kuder Richardson 20 (K-R_{20}) scale.

In order to ascertain the reliability of the instrument, the Basic Mathematical Achievement (BMAT) was administered to 20 students sampled from the study area but who were not part of the sample in the study. The reliability of the BMAT was estimated using Kuder Richardson 20 (K-R20) statistical model which yielded a reliability index of 0.89 which was considered high enough for the study.

The Basic Mathematical Achievement Test (BMAT) developed for this study was administered to the students as pretest by the research assistants in advance of the experimental treatment/exposure. The scripts were retrieved, marked and scores recorded (as pretest scores). At the end of the treatment, the test items were reshuffled and administered, marked and scores recorded as posttest scores. Both the pretest and posttest scores used for data analysis. To ensure consistency and objectivity in scoring the students' work, marking scheme or model answers were provided for BMAT.

The study was carried out in three distinct phases of experimental procedure that is, Pre-treatment phase, Treatment phase and Post-treatment phase.

Results

Research Question 1: What are the mean achievement scores of students who were taught Mathematics using Reciprocal Peer tutoring, and lecture method?

The results for answering research question 1 were presented in the Table 4.1.

Table 4.1: Pretest and Posttest achievement mean scores of students taught Mathematics using Reciprocal Peer tutoring, and Conventional Lecture method

		Pretest		Posttest		
Group	**N**	$\bar{X}$	**SD**	$\bar{X}$	**SD**	**Mean gain scores**
RPT (Exp1)	42	21.60	3.46	36.40	3.51	14.80
CLM	41	21.80	3.73	24.86	3.88	3.06

RPT= Reciprocal Peer tutoring Strategy, AOS=Advance Organizer strategy, Lect. Mtd. = lecture method

The data in Table 4.1 show that the students taught Mathematics using Reciprocal Peer tutoring had a Pre-test mean score of 21.60 with standard deviation of 3.46 and a Posttest mean score of 36.40 with standard deviation of 3.51, while their counterparts in the conventional lecture method (Control group) had a Pre-test mean score of 21.80 with a standard deviation of 3.73 and a posttest mean score of 24.86 with the standard deviation of 3.88. The result further showed that the students taught Mathematics using Reciprocal Peer tutoring had a mean gain of 14.80 while those taught Mathematics using the CLM (control group) had a mean gain of 3.06. This showed that RPT had increasing effect on the students' academic achievement in Mathematics, having recorded higher mean gain score than the lecture method. In other words, the use of Reciprocal Peer tutoring strategy in teaching Mathematics resulted to a higher mean achievement scores of students.

A corresponding hypothesis that addressed the above research question is:

Hypothesis 1: There is no significant difference among the mean achievement scores of Upper Basic 2 students who were taught Mathematics using Reciprocal Peer tutoring, and lecture method.

Table 4.2:Analysis of Covariance (ANCOVA) on the mean achievement scores of Upper basic 2 students taught Mathematics using Reciprocal Peer Tutoring, strategy and Conventional Lecture method

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	32402.109[a]	3	10800.703	376.962	.000
Intercept	2261.155	1	2261.155	78.919	.000
Pretest	2207.663	1	2207.663	77.051	.000
Group	3449.150	1	3449.150	120.381	.000
Error	3352.336	117	28.652		
Total	145622.340	120			
Corrected Total	23177.084	119			

Significant at 0.05 level of significance

Research Question 2: What are the mean achievement scores of male and female students who

were taught Mathematics using Reciprocal Peer tutoring strategy?

Table 4.3:Pretest and Posttest achievement mean scores of Male and Female Students taught Mathematics using Reciprocal Peer tutoring strategy

		Pretest		Posttest		
Gender	N	$\bar{X}$	SD	$\bar{X}$	SD	Mean gain scores
Male	22	21.33	3.55	36.48	3.80	15.15
Female	20	21.87	3.63	36.29	3.74	14.42
Effect						0.73

Significant at 0.05 level of significance

The results in Table 4.3 revealed that male students taught Mathematics using Reciprocal Peer tutoring had Pretest mean achievement score of 21.33 with standard deviation score of 3.55 and also had posttest mean achievement score of 36.48 with standard deviation score of 3.80. Their female counterparts also recorded a pretest mean score of 21.87 with standard deviation score of 3.63 and a posttest mean achievement score of 36.29 with standard deviation of 3.74. The table further indicated that the male students recorded a mean gain of 15.15 while the female students had a mean gain score of 14.42. This implies that the male students taught Mathematics using Reciprocal Peer tutoring had a slight higher mean gain score of 0.73 over their female counterparts.

A corresponding hypothesis that addressed the above research question is:

Hypothesis 2: There is no significant difference between the mean achievement scores of male and female Upper Basic 2 students who were taught Mathematics using Reciprocal Peer tutoring.

The data for testing hypothesis 2 were analyzed with ANCOVA and the results presented in Table 4.5.

Table 4.4: Analysis of Covariance (ANCOVA) of Achievement scores of Male and Female Upper Basic II Students taught Mathematics using Reciprocal Peer tutoring

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	7129.328 [a]	2	3564.664	45.695	.000
Intercept	287.446	1	287.446	3.685	.000
Pretest	4065.231	1	4065.231	52.112	.000
Gender	84.773	1	84.773	1.087	.133
Error	3120.341	40	78.009		
Total	133001.218	42			
Corrected Total	22754.300	41			

Significant at 0.05 level of significance

Summary of the Major Findings

Base on the data analysis, the major findings of the study are as follow:

1. RPT strategy had statistically significant and increasing effect on students' academic achievements in Mathematics when compared to the lecture method.
2. The male students taught Mathematics using RPT had a slightly higher mean achievement gain score over their female counterparts, though the difference between their mean achievements scores was not significant. **Discussions**

Discussion of findings was carried out sequentially based on the research questions and hypotheses that guided study.

Effect of Reciprocal Peer tutoring and CLM strategies on Upper Basic 2 students' academic achievement in Mathematics

The results further indicated that Reciprocal Peer tutoring strategy recorded a slightly higher effect on the students' academic achievement in Mathematics than those exposed to the CLM.

The result simply implies that the use of Reciprocal Peer tutoring strategy is more effective in enhancing the achievements of students taught Mathematics than the use of CLM. The results are supported by the earlier findings by Fabros and Ibanez (2023), Ndirika and Ubani (2017), Shihusa and Keraro (2009), and Apochi, Umuonu and Onah (2018) who in their respective studies found the experimental strategy (RPT) to be more effective in increasing students' academic achievement in school subjects. The outperformance of students exposed to Reciprocal Peer tutoring strategy over their counterparts in the CLM group could be attributed to the unique and the inherent characteristics of the RPT instructional strategy which includes allowing the learners help each other participate actively in their teaching and learning processes that normally involves questions and answer sessions, discussion and interactive lessons (Lestari, 2016). The results of the present study are also not surprising as a similar study by Agu (2018) and Ezeanya and Okigbo (2021) showed that RPT is very effective in enhancing achievement of students in school subjects when compared with other teaching and learning strategies.

Effect of Gender on Upper Basic 2 students' academic achievement in Mathematics when exposed to Reciprocal Peer tutoring strategy

The results revealed that the male students taught Mathematics using RPT had a slightly higher mean gain score over their female counterparts. In other words, the male students taught mathematics using Reciprocal peer tutoring had a little higher mean achievement in mathematics than their female counterparts, exposed to similar teaching and learning strategy. This implies that male students gained higher achievement in mathematics than their female counterparts. The results supported the results from the earlier studies by Hamah, Parker and Nash (2002) as well as that of Agu and Azilu (2019) on the effects of peer tutoring on academic achievement and gender effect on Physics and Business studies respectively which showed that male students had superior achievement over their female students. However, the difference was also not statistically significant. The slight superior achievement of males over the female students could be in line with Owoeye (2016) who maintained that an average girl child grows into adulthood with the stereotypic mindset that some subjects such as mathematics and other math-based subjects are specially preserved for the boys. In other words, female students feel inferior to the males when mathematics and math-related subjects are being taught. The result corroborated the results from the earlier studies by Daniel (2021) and Abdulaheem, Yusuf and Odutayo (2017) who in their respective studies on effect of Peer tutoring strategy on students'

achievement in Biology and Economics found among others that there was no significant difference between the mean achievement of male and female students taught Biology and Economics respectively using peer tutoring strategy. The result also agreed with Odagboyi (2015), who summarily noted that academic achievement is free from gender influence. Abubakkar and Oguguo in Odagboyi (2015) specifically stated that the performance of male and female in the school when they were subjected to a test had no significant difference.

Conclusion

Findings of the study indicated that students taught Mathematics using RPT performed statistically better than those taught using CLM irrespective of gender difference.

Recommendation

Based on the findings and conclusion of the study, the following recommendations were made:

1. Teachers of Mathematics at the Upper Basic level should always use Reciprocal tutoring instructional strategy in teaching the subject.
2. Government through its curriculum making bodies or agencies should emphasize RPT as instructional mode the delivery of Basic Education curriculum
3. Teacher Education curriculum at tertiary level should make RPT integral component of teaching methods.

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