PROMOTING SELF-REGULATED LEARNING THROUGH SELF- AND PEER-ASSESSMENTS TECHNIQUES AMONG SECONDARY SCHOOL STUDENTS

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ABSTRACT

The study investigated how self-regulated learning can be enhanced through the use of self-and peer-assessments techniques. Two research questions and two null hypotheses guided the conduct of the study. The study used a sample of one hundred and forty-five (145) Senior Secondary Three chemistry students selected purposively from four senior secondary schools in Emohua Local Government Area of Rivers State, Nigeria. The four schools were assigned to three experimental groups (self-assessments, peer-assessments and a combination of self-and peer-assessment techniques) and one control group (teacher-assessment technique). The study adopted the Pre-test and Post-test non-equivalent quasi-experimental design. Data were collected from a 22-item instrument tagged Self-regulated Learning Scale (SRLS), which was responded on a four-point Likert scale format. The instrument had a convergent construct validity index of 0.79 as well as an internal consistency index of 0.86 determined using Cronbach Alpha Method. Analysis of data was done using mean, standard deviation, paired t-test statistics and analysis of covariate where appropriate. Results revealed that except teacher-assessment, self-assessment, peer-assessment and a combination of self-and peer-assessments techniques were effective in promoting self-regulated learning. However, the combination of self-and peer-assessment techniques was the most effective followed by self-assessment only, peer-assessment only and then teacher-assessment technique. Following the result of the analysis, it was recommended among all, that alternative assessment techniques via self-and peer-assessments should be given more serious attention.

Key Notes: Self-regulated learning, self-assessments, peer assessment and teacher-assessment.

Introduction

The expectation of any society for the students is continuous improvement in their competencies and to be up to date with the developments in the area of their specialisation. So the important roles of teachers include helping learners to learn how to learn and producing independent and lifelong learners. Woolfolk, Hughes, and Walkup (2008) stated that one of the goals of teaching is to produce independent learners that can continue their learning throughout their lives. For learning to be continuous in one's life, the individual must be a self-regulated learner who is capable of controlling his/her learning. Brydges Nair, Ma, Shanks, & Hatala (2012) asserted that one of the qualities of a lifelong learner is the ability to control and monitor one's learning activities. In other words, lifelong learners are individuals who can regulate their own learning.

Self-regulated learners are persistent in learning even in the face of many challenges and odds. This is because they are self-disciplined and have the willpower which shields them from distraction, hence they are focused and follow through (Woolfolk et al 2008). At times when high self-regulated learners are distracted, they quickly find ways to refocus (Harding, 2018) sequel to this Woolfolk et al (2008) viewed them as learners with a high dose of volition.

Self-regulated learners are intrinsically motivated learners who find many tasks in the school interesting due to the value they attached to learning. Sometimes they are regarded as expert learners who know the strategy needed to overcome challenges associated with a given task no matter the difficulty of the task. That means they learn easily because they possess both academic learning skills and self-control. To Murphy and Alexander (2000) self-regulated learners are individuals that have both the skill and willpower to learn.

Self-regulated learners are capable of having sound cognitive, metacognitive, motivational and emotional characteristics that promote learning. Self-regulated learners are more organized, hard-working, self-critical and very interested in learning (Ganda & Boruchoviteh, 2018). Schraw, Crippen, and Hartley (2006) asserted that self-regulated learners possess the skills of goal setting, self-monitoring, self-instruction, and self-reinforcement.

Sequel to these, it is obvious that a self-regulated learner learns through self-regulation. Self-regulation is the skill that involves selective use of specific processes that enable individual to personally adapt to the specific learning task. It is a self-directed process and set of behaviours that help learners to transform their mental abilities into skills (Zimmerman, Bonnor & Kovach, 2002). Self-regulation is the series of actions that learners use to activate and maintain their thoughts, behaviours, and emotions so as to achieve their goals (Zimmerman, 2002).

To Wiemer (2010), self-regulation is neither mental skills alone nor an academic performance skill alone but it is a combination of both mental and academic skills, so any learning that is via self-regulation skills is self-regulated learning. Self-regulated learning consists of three different components: cognition, meta-cognitive and motivation. The cognition component relates to skill and persistent behaviour that are needed to help students encode, memorise, and recall information and to think critically. Meta-cognition component relates to skills that enable students to comprehend and monitor their cognitive processes. Then the motivation component relates to the beliefs and attitudes that influence students action in cognition and metacognitive skills (Teaching Excellence in Adult Literacy Center, 2010).

Self-regulated learning is an individual's ability to understand and control ones learning environment (Schraw, et al 2006). To Woolfolk et al. (2008) it is learning through the combination of academic learning skills and self-control. It is how learners regulate their own cognition, metacognition, emotions, and behaviour during any learning experience. Good self-regulated skills include good time management, ability to select the most effective and efficient strategies for solving problems and the ability to actively monitor emotional states such as frustration and anxiety (Harding, De Barba & Goh 2016). To the researchers, self-regulated learning is the ability of an individual to implement knowledge appropriately through self-direction, self-awareness, self-monitoring, self-mentoring and behavioural skill.

There are some benefits that are derived from self-regulated learning, such benefits include preparing individuals for lifelong learning, aid for transfer of skills, knowledge, and abilities from one domain to another. It is also helpful in producing learners with high intrinsic motivation capable of using deep processing learning strategies in performing academic tasks (Zimmerman,2011). Self-regulated learning help to enhanced self-efficacy and sense of responsibility among learners. It also helps to promote effectiveness in learning since the students have the self-confidence to learn both in the presence and absence of their teachers. It is a key-factor of high academic achievement as high self-regulated learning help students to transfer learning from one subject area to another and from one domain to another. Hence self-regulated learning helps to strengthen students ability to learn new skills (Harding, 2018).

Self-regulated learning helps students to be involved in goal setting, reflection on their learning and promotes proper and adequate adaptation of learning strategies. It is surprising that, despite the importance of self-regulated learning, researches had proved that some students are engaged in self-regulated learning throughout their education levels, many expressed deficiencies in the ways they are motivated to learn and the strategies they adopt to learn while some do not (Zimmerman and Schunk 2008, Bembenutty, 2011). That means there are individual differences in self-regulated learning

among students. This is evidence in their classroom behaviours where some of the students ask relevant questions, take notes of the high points/important facts about a topic, allocate their time and resources adequately as to reach their goals. On the contrary, some others do not have time for all these even when they do, they are carelessly done.

Furthermore, learning efficiencies and difficulties differ among students leading to differential levels of performance in all the educational domains. These differential performance levels had been attributed to different factors such as teachers, and students factors (Tamade, 1996, Orluwene, 2006). However, some researchers, Zimmerman (2008) Brinstein and Glaser (2011) attributed it specifically to students' levels in self-regulated learning.

Acquisition of self-regulated learning skills is difficult for some individuals and very easy to some others. Woolfolk et al (2008) reported that some individuals learn how to regulate their own learning and behaviour at their early age within the family context (informal approach), while others do not and may need some additional intervention to regulate their learning. It was also observed that among those who can regulate their learning some are experts regulators of their learning than others. To this end, Woolfolk et al (2008) suggested that individuals that lack self-regulated learning and those who are low regulators of their learning may need additional intervention to be provided by their teachers in the classroom in order to encourage them to regulate their learning. In giving credence to the aforementioned Zimmerman and Schiunk (2008) asserted that self-regulatory skills are complex processes but it can be taught to be improved upon. To develop and improve self-regulatory skills among students, engaging them in activities that aid monitoring, reflecting, controlling and adjusting their behaviours are indispensable.

In line to this, Brown, Bull and Pendlebury (1997) stated that when teachers observed that the expected behaviours or level of outcomes are not achieved with the use of the existing method or technique of assessment, they should consider changing and adopting an appropriate innovative method of assessing the intended behaviours. In other words, if one wants to change students learning, the method of assessment must be changed. Assessment is a necessary and significant determinant of what, when and how students learn in every domain of the educational objective. Sequel to this, Race, Brown and Smith (2005) stated that there is nothing teachers do to their students that surpasses their assessment of the students' work and the feedback students received from them. In the same vein, Cowan (2005) asserted that assessment is inescapable and it is the engine which drives students learning. However, an assessment that drives students learning is not just any assessment but an assessment that is rightly done. So to ensure the intended skills, behaviours and knowledge are properly assessed Cowan (2005) emphasized that getting assessment right" is therefore very important. This is because results and feedback from teachers well-designed assessment of students' work influence the students learning all through their lifetime and also make them active learners.

Succinctly, Race et al (2005) suggested that to encourage independence in students learning, teachers should not always use assessment for ascertaining students levels of progress only but in addition use assessment as a means of supporting active learning. In other words, teachers should not spend most of their time in Assessment of learning (AOL) rather for Assessment for learning (AFL) which provides students the opportunity of assessing and evaluating themselves.

Over the recent years, there had been a shift in the nature of the classroom environment from teacher-centred to student-centred classroom approach. To effectively tap the power of the student-centred classroom approach, there was an emergence of assessment paradigm from Assessment of Learning (AOL) to Assessment for Learning (AFL) which is formative in nature. Specifically, there is

a change from the traditional assessment technique where teachers are the sole assessors of students learning to an alternative assessment where students become co-assessors with teachers as well as active learners.

Incongruent to this, Leung (2007) opined that the traditional assessment where the teachers are the sole assessors is no longer valid nowadays. This possibly could be that traditional assessment techniques (teacher-centred) do not reflect the principles of constructivist learning in its design and implementation process. Owing to this, Spiller (2012) suggested adopting assessments that align more closely the principle of constructivist learning, which emphasise the active role of the learner in building understanding and making sense of information. Again teachers should not be the sole arbiters of teaching and assessment planning but that students should be the co-arbiters of planning what relates to teaching and assessment. Boud and Falchikov (2006) noted that when students are actively involved in assessment design, its selection, standard, and judgment making their adequate preparation for lifelong learning and for working life are guaranteed.

For proper and adequate selection of the alternative assessment techniques that aid active learning among learners Gibbs in Wilson (2002) gave a strong suggestion on the use of self- and peer assessment techniques. This is because Hargereves, Barl, and Schmidt (2001) reported that with the current wind of assessment paradigm, self and peer-assessment techniques had gained momentum in the field of education as the assessment techniques that centred in the principles of the constructivist theory of learning. Sequel to this, the present study is anchored on the constructivist theories of learning, which focus on how individuals learn meaningfully both on their own and in the interaction with others. In its focus, the study considers self-assessment, peer-assessment, a combination of self- and peer-assessment and teacher-assessment as the independent variables while self-regulated learning is the dependent variable.

Self-assessment is conceptualized as the involvement of students to reflect on their own works and make judgments on their performance against the identified criteria (Boud, 1995). To Elliot et al (2000) self-assessment requires students to personally examine their behaviour or learning so as to determine if the desired behaviour has been elicited. Efklides (2011) asserted that self-assessment requires learners to judge their own progress and performance using the assigned criteria in order to learn and improve in their future performances.

Self-assessment is a valuable learning tool as well as an assessment technique. It helps students to identify their weaknesses, strengths as well as gaps in their performance, it helps them to determine where much attention is needed in their learning. Again self-assessment helps students to set realistic goals and revise their work. In all, it promotes self-reflection, motivation, and self-responsibility for learning.

Peer-assessment is the process whereby students are used to grading each other's work based on the teachers' benchmarks. It is a collaborative learning technique where students evaluate each other's work. Peer-assessment is the assessment of students work by other students of equal status (Lutze-Mann, 2018). Falchikov (1995) viewed peer-assessment as the learners' reflection on their classmates' work against the assigned standard or criteria. To the researchers, peer-assessment is the process to which students are giving the responsibility of identifying the quality of their classmates' work and based on the teachers' criteria make a judgment about the extent the goal has been achieved.

Peer-assessment is a powerful metacognitive tool that helps to engage students deeper in the learning process. It also helps to develop the students' ability to reflect and critically judge their own learning. It aids the development of critical thinking among students, it gives the students the opportunity of exchanging feedback on their own and their peers work. Peer-assessment personalizes

the learning experience and potentially motivates continuous learning. It challenges the role of the teacher as the sole arbiter of assessment.

The combination of self- and peer-assessment is the process whereby students are given the opportunity to personally assess their own works and the work of their classmates. Spiller (2012) asserted that self-assessment can be used in conjunction with either peer or teacher assessments to promote adequate collaborative feedback and easy transfer of learning among students. That is the combination of self- and peer-assessment help to increase students responsibility for active learning. Both self and peer assessment techniques are valuable learning tools which help students to develop strategies for self-regulated learning, understand their learning goals, how to achieve the goals and then make effective revision appropriately (Gibbs in Wilson, 2002).

Then teacher assessment is the assessment technique where the teacher is the sole assessor of students' works. It is regarded as the traditional and formal method where teachers take the sole responsibility for assessing students' performance (Brown & Hudson in Zarei & Uselfi, 2015). Spiller (2012) noted that assessment processes in which the teacher holds all the powers and makes all the choices limit the potential for which learners will develop their meta-cognitive and self-directive skills.

In relation to past empirical studies that investigated the link between assessment and self-regulated learning, many studies had been done. For instance, Fathi, Mohammed Yousefi, and Sedlghravesh (2017) conducted a study on how self-assessment and peer-assessment can impact on the self-regulated learning of Iranian EFL students. From their study, it was reported that both self-assessment and peer-assessment positively impacted on the self-regulated learning of the students. In 2012, a study conducted by Kostons, Vand, Gog, and Paas was on the impact of self-assessment and task-selection skill training on self-regulated learning. Based on the results of the data analysis, it was concluded that both self-assessment and task-selection skills training are highly instrumental to self-regulated learning.

Zarei and Uselfi (2015) carried out a study on the effectiveness of self-assessment, peer-assessment, and teacher-assessment of EFL learners self-regulation. They found no significant difference among the self-regulation of students exposed to the three different assessment types. Butler and Lee (2010) examined the effects of self-assessment among EFL learner. They reported that self-assessment aided the improvement of the students' self-confidence and learning.

Amakin and Orluwene (2016) investigated the effect of assessment for learning strategies on Biology achievement of students. They reported that the combination of self- and peer-assessment was effective in promoting biology achievement among students.

Furthermore, Zariel and Saya Mahdavi in 2014, investigated the differential effects of peer- and teacher-assessment on EFL learners' grammatical and lexical writing accuracy. They reported that peer assessment group perform better than their counterparts who were assessed by teachers. Meusen, Brinke & Boshuizen (2014) investigated the effect of formative assessment in self-regulated learning among upper primary school pupils. They found that self-regulation was highest in the self-assessment intervention, followed by the peer assessment and then teacher-assessment groups. However, no significant difference was observed in the mean scores of the self-assessed and peer-assessed group when compared in relation to their self-regulation.

In overall, after considering the importance of self-regulation, self-assessment and peer-assessment, and the fact that none of the past empirical studies reviewed was conducted in relation to chemistry students in the secondary schools. Again that none used the combination of self-and peer-

assessment techniques as one of their independent variables or treatment groups. The researchers were compelled to embark on the present study which aimed at promoting self-regulated learning of students in secondary schools through self-assessment, peer-assessment, a combination of self- and peer- assessment and teacher- assessment techniques.

The choice of students in secondary schools was informed by the fact that secondary school is the level that determines the quality of those who enter the tertiary levels of education and/or those who will be at workplaces. Secondly by the notion made by Dignath, Buellner, and Langfeldt (2008) that enhancing the self-regulation skills of individuals should be early enough at their lower levels of education so as to help them excel in their subsequent learning and schooling. Meanwhile, secondary school students are expected to self-represent and plan task, monitor and assess the adequacy of their performance, cope with difficulties and make the necessary adjustments concerning the achievement of stated goals (Efklides, 2011)so to meet up with these demands, self-regulation of their learning is very crucial.

The choice of chemistry students was basically due to the wide applications of chemistry to the development of self and the society through the use in the manufacturing of food, medicine, treatment of illness, diagnosis of illness, science and technological literacy and then the preparation of the future scientists and technologist etc.

Moreso, the choice of the self and peer assessment in this study was informed through the assertion made by Nicol and Macfarlene-Dick (2005) that despite the shift in the conception of teaching from teacher-centred to student-centred classroom, a parallel shift in relation to formative assessment has been very slow to emerge. Again Brydges et al (2012) asserted that increasing demand for lifelong learners and reflective practitioners provoked new approaches to assessing students. Meanwhile, it was also suggested that formative assessment involving self- and peer-assessment empowers learners as self-regulated learners (Sluijsmans, Joosten-Ten, Brinke & Vander Vleuten, 2013, Clark, 2012).

Finally the focused of the study on self-regulated learning stemmed from the fact that it is an extraordinary umbrella which covers a good number of factors that influence learning such as cognitive, metacognitive, behavioural and emotional aspects of learning. To Crown it, Harding, et al (2016) stated that the movement from teacher-centred classroom to the learner-centred classroom highlighted the need for all learners to acquire self-regulated learning skills irrespective of their age.

To accomplish the aim of this study two research questions were raised, they are

1. How does the practice of self-assessment, peer-assessment, a combination of self- and peer-assessment, and teacher-assessment techniques promote self-regulated learning of chemistry students in secondary schools?
2. To what extent does the self-regulated learning of the students exposed to self-assessment, peer-assessment a combination of self-and peer-assessment and teacher-assessment differ?

Method

Design: A quasi-experimental design by non-equivalent pretest-posttest control group study was conducted to examine the impact of self-assessment and peer-assessment on self-regulated learning of secondary school students.

Sample: A sample of 145 senior secondary three (SS III) students chosen through two-stage sampling method in Emohua Local Government Area of Rivers State, Nigeria was used for the study. At stage 1, four public secondary schools were chosen out of 21 public secondary schools in the area using a simple random sampling technique by balloting method. Then, in stage 2, SS(III) chemistry students

were instantly chosen in each of the four selected secondary schools through purposive sampling method.

Instrument: The study made use of an instrument tagged self- regulated learning scale (SRLS) to measure the students' levels in self-regulated learning. It was a 22-item scale made by the researchers using a four-point Likert format with the response levels ranging from strongly, agree to strongly disagree. They were weighted 4 points to 1 point respectively hence it had a minimum of 22 marks and a maximum of 88 marks where high and low marks indicated high and low levels of self-regulated learning.

However, to aid the use of the convergent method of determining construct validity, a second instrument tagged self-regulated learning questionnaire (SRLQ) developed by Zarei and Hatami (2012) that also measure self-regulated learning of students' was employed. The two instruments, SRLS and SRLQ were administered to 30 students selected outside the chosen sample during the trial testing to collect two sets of scores from each student for the purpose of convergent (construct) validity via Pearson product moment correlation technique. That is the set of scores from the two instruments SRLS and SRLQ were correlated using PPMC afterward, and this yielded a construct (convergent) validity index of 0.79 indicating that SRLS possess the adequate construct for use in the study.

Thereafter, the reliability of SRLS, the main instrument for the study was determined using Cronbach Alpha method. This was conducted using only the scores from SRLS and it yielded an internal consistency index of 0.86 indicating high reliable instrument for the study.

Procedure: To achieve the aim of this study, the researchers employed a procedure that was executed in stages. At stage one, only senior secondary school III chemistry students were selected in each of the four public schools chosen. These students were informed about the aim of study in order to prevent or reduce the level of confusion and anxiety. Again at this, stage, the homogeneity of the students was checked. This was done by ensuring that only SS (III) students who have been studying chemistry as a single subject for about two years now were chosen. Secondly, the researchers ensured that none of the four schools chosen had been using self-assessment and peer-assessment except teacher-assessment technique in assessing their students work. Again that none of the schools have taught/covered the topicssulphur and its allotropes, hydrogen sulphide, sulphur (iv) oxides and sulphur (vi) oxides, and tetraoxosulphate (vi) acid that were taught during the treatment session

In stage two, copies of the instrument, SRLS were pretested on the SS (III) students from the four selected schools. During the administration (pretest) the students were asked to respond to the item statement by choosing from among the four options which ranged from strongly agree to strongly disagree as it appeals to them within 35 minutes. The responses of the students were scored and recorded based on their schools. This was done within a week

At stage three, the 145 SS (III) students from the four schools were randomly assigned to a self-assessment condition, peer assessment condition, a combination of self- and peer-assessment condition or a teacher-assessment condition based on their school. That is the SS (III) students from a school were exclusively assigned to a particular treatment condition which gave rise to three experimental and one-control groups used for the study.

After assigning the students to the different treatment groups based on their schools, the 16-session treatment period began. For the 16 sessions treatment the students from the four different schools chosen were taught the same aforementioned four topics using the same teaching method, they were also tested at the end of each topic using the same questions but they were rated using different

assessment techniques: So only the students in the three experimental groups (self-assessment, peer assessment and the combination of self- and peer-assessment techniques, received instruction on the rating mechanism, that is how to use assessment marking guide/rubrics in assessing themselves, their classmates and both respectively while those in the teacher assessment group were not instructed on the rating mechanism. The treatment which covered teaching, testing and rating lasted for 8 weeks, thereafter the post-test commenced.

Then in stage four, after the treatment period, the same SRLS used during the pretest period was also post tested directly on the four groups of students to measure the students' level of achievement after their exposure to the different assessment techniques. This was done within one week using the direct-delivery approach with the assistance of the 4 chemistry teachers in the 4 different schools. The copies of the instrument were retrieved immediately after 35 minutes, scored, collated and subjected to statistical analysis. The statistical analysis was done using mean, standard deviation, paired t-test, analysis of covariate (ANCOVA), and post hoc multiple comparisons via Bonferroni test appropriately.

Results

After analysis of the data, the results obtained for research question1 and its corresponding null hypothesis are presented together in table 1, that for hypothesis 2 is presented in table 2 while the results of the post hoc multiple comparisons are represented in table 3.

Table 1: Mean, standard deviation and paired t-test on the effect of assessment techniques on self-regulated learning of students.

Group	**Test mode**	**N**	**Mean**	**Std**	**Gained mean**	**Df**	**Cal.t value**	**P-value**
Self-assessment	Posttest	43	38.95	10.45	8.77	42	5.13	0.0005
	Pretest		30.19	6.88				
Peer-assessment	Posttest	35	38.40	11.21	8.29	34	3.34	0.002
	Pretest		30.11	8.85				
Self- and peer-assessment	Posttest	36	41.92	8.02	11.75	35	7.85	0.0005
	Pretest		30.17	5.44				
Teacher-assessment	Posttest	31	30.68	5.05	0.19	30	1.18	0.246
	Pretest		30.48	4.74				

Results in table 1 show that the group that was treated using self-assessment technique had the mean scores 30.19 (SD = 6.88) and 38.95 (SD = 10.45) in their pre and post tests respectively with a gained mean of 8.77 from the pretest to the post-test. When their mean difference was subjected to paired t-test analysis a calculated t-value of 5.12 was obtained at df of 42 at P = 0.0005 < 0.05. Thus, self-assessment technique significantly promotes self-regulated learning among students.

For the group exposed to peer assessment technique, they had the pretest mean score of 30.11 (SD = 8.85) and a post-test mean score of 38.40 (SD = 11.21) thus the gained mean score of 8.29. On subjecting the mean difference to a paired t-test analysis a calculated t-value of 3.34 was obtained at df of 34 at P = 0.0005 < 0.05 level of significance. Thus peer-assessment had a significant impact on self-regulated learning of the students.

Again as table 1 shows, the group treated with the combination of self- and peer-assessment techniques had the pretest mean score of 30.17 (SD = 5.44) and a post-test mean score of 41.92 (SD = 8.02). Thus they gained a mean score of 11.75. It was also shown that there was a significant impact of the combination of self- and peer- assessment techniques on self-regulated learning of students (34) = 7.85, P = 0.0005 < 0.05).

Finally, in table 1, it was shown that the group treated with teacher-assessment technique had the pretest and post-test means scores of 30.48 (SD = 4) and 30.68 (SD = 5.05) respectively, hence they gained a mean score of 0.19. The same table 1 also shows that teacher-assessment technique had no significant impact on self-regulated learning of students t (30) = 1.18 P = 0.246 > 0.05.

Considering the post-test mean scores and the gained mean scores of all the four groups of students, it can been seen from Table 1 that the third group, which received a combination of self- and peer-assessment had the highest post-test mean score and the highest gained mean score followed by the first group, which received self-assessment, the second group, which received peer-assessment and then the fourth group, which served as the control group and received teacher-assessment had the lowest post-test and gained mean scores. To determine whether the observed differences in their post-test mean scores are statistically different ANCOVA test was employed, the results of which are presented in table 2.

Table 2: Summary of tests of between-subject effects of assessment techniques on self-regulated learning of students.

Tests of Between-Subjects Effects

Dependent Variable: SRLposttest

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	2559.655[a]	4	639.914	7.744	.000	.181
Intercept	6315.554	1	6315.554	76.428	.000	.353
SRLpretest	307.113	1	307.113	3.717	.056	.026
Group	2282.665	3	760.888	9.208	.000	.165
Error	11568.718	140	82.634			
Total	221159.000	145				
Corrected Total	14128.372	144				

a. R Squared = .181 (Adjusted R Squared = .158)

After adjusting for pre-test scores, table 2 shows that there was a significant difference among the four assessment technique groups on post-test mean scores of the students in self-regulated learning scale (SRLS), F(3,140) = 9.21, P = 0.000 < 0.05, partial eta squared = 0.165.

Table 3: Pairwise multiple comparison via Bonferroni test

Group compared	**Mean diff**	**P-value**
SA vs PA	0.538	0.798
SA vs SAPA	2.97	0.158
SA vs TA (control)	8.34*	0.0005
PA vs SAPA	3.51	0.111
PA vs TA (control)	7.80*	0.0
SAPA vs TA (control)	11.31*	0.0005

*The mean difference is significant at the 0.05 level.

Note:

SA = self-assessment
PA = peer-assessment
SAPA = self- and- peer-assessment
TA = teacher-assessment

As seen in table 3, the mean difference between self-assessment and peer-assessment, groups, self-assessment and the combination of self- and peer-assessment groups, and that between peer-assessment and the combination of self- and peer-assessment groups were not significance ($P > 0.05$). on the contrary, the mean differences between self-assessment and teacher-assessment, peer-assessment and teacher assessment (control) and that between the combination of self- and peer-assessment and teacher-assessment (control) were significant ($P<0.05$). In other words, the experimental conditions in self-assessment, peer-assessment and the combination of self and peer-assessment groups were more effective in promoting self-regulated learning than the teacher-assessment technique.

Discussion of Finding

The findings of the present study revealed that expect teacher- assessment, the use of self-assessment, peer-assessment, and a combination of self- and peer-assessment techniques significantly contributed to the improvement of self-regulated learning among students. The finding that self-assessment and peer-assessment techniques significantly enhanced self-regulated learning among students are in line to that of Konstons et al (2012), Fathi et al (2017) and Butler and Lee (2010). However, the finding of the present study that the combination of self-and peer-assessment technique significantly boosted self-regulated learning of students is not in line with that of Butler and Lee (2010). This finding may be that self-assessment and peer-assessment expose the students to the required criteria of the task at hand, which in turn help to enhance their future learning. This is because their exposure to the needed standard/criteria will help them to identify what makes up good and quality responses to a given task thereby equipping them for future learning. It could also be that exposure to the required standard provided specific positive and negative feedback to the students thereby increasing the amount and quality of feedback the students received which in turn will empower and prepare them for high achievement in future.

Another reason for the significant effect of self-assessment and peer assessment technique separately may be that they are geared towards learner-centred approach as well as their alignment to the principle of constructivists learning. As a result, self-assessment and peer assessment aid students to reflect on their studies which promote their active engagement in the studies. The difference in both findings may emanate from the fact that the present study considered the combined effects of self- and

peer-assessment in conjunction to their separate effects on self-regulated learning while the previous studies focused on the independent effects of self-assessment and peer assessment on self-regulated learning.

Again another finding from the study indicated that teacher-assessment technique did not significantly promote self-regulated learning of students. This finding corroborated that of Spiller (2012) and that of Leung (2007). The present finding could be traceable to the following reasons: firstly teacher-assessment technique contradicts the principles of constructivist learning in its design and implementation process. Secondly, it could be that teacher-assessment technique is not geared towards the acquisition of self-regulated skills because Harding et al (2016) asserted that self-regulated skills are activated in a child-centred environment which teacher-assessment does not encourage. So self-regulated learning of the students in the fourth group was not improved upon because teacher-assessment technique is not the right technique to be adopted when it comes to the acquisition of self-regulated learning. Cowan (2005) asserted that assessment can only drive students learning when it is rightly done.

In the study, it was also found that the combination of self- and peer-assessment technique had the highest post-test mean scores and the highest gained mean. This could be traceable to, the fact they received a two-edged arrow influence where at one end they received the effect from self-assessment and at the other end, they received the effect of peer-assessment techniques. These two assessment techniques had been recorded as very instrumental techniques for the acquisition of self-regulated learning of students. So their combination creates room for exchange of ideas and knowledge which in turn help them to identify the gaps in their learning as well as achieving a sophisticated grasp of the learning process. In other words it could be that the use of peer-assessment technique create room for cognitive apprenticeship, peer feedback and collaborative learning among students at one end, while at the other hand self-assessment aid students to reflect and take responsibility of their own learning, it could also be that through self-assessment they receive elaborate and descriptive feedback which will help to showcase the expected outcomes, hence empowering them for future. In all, the combination of self- and peer-assessment places the students as learners and assessors through which good learning process can be acquired via self-monitoring, self-evaluation and peer modeling and self-center active engagement. Prior research provides adequate support that self-monitoring and learner-centred promote self-regulated skills.

Furthermore, it was also found from the present study that significant differences existed among the effects of self-, peer, a combination of self- and peer, and teacher-assessment techniques. This finding is similar to that of Zarei et al (2014) but contradicted that Zareel and Uselfi (2015).These finding could be traceable to a number of factors, which may include differences in the level of students used. Most of the previous studies used students of higher institutions while the present study used students of secondary schools. The second reason could possibly be related to the subject taught where the present study used chemistry, the prior researchers used the English language and other subjects outside chemistry.

More so, the present study revealed that further analysis using post hoc multiple comparisons via Bonferroni test proved that no significant difference was observed when mean scores of the group who received self-assessment and peer-assessment, self-assessment and a combination of self- and peer-assessment, peer-assessment and the combination of self- and peer-assessment were compared. This finding is similar to that of Meusen et al (2014) but not similar to that of Butler and Lee (2010).These finding could be that self, peer and their combination assessment techniques are all

geared towards student-centred principles. Thus they promote active engagement of learners, self-monitoring and quality feedback.

Finally, it was found that the post-test mean scores of the groups exposed to self, peer, a combination of self- and peer-assessment when independently compared to those who received teacher-assessment technique differ significantly. This finding corroborated that of Zarei et al (2014) but was not similar to that of Zarei and Uselfi (2015). These differences in the findings may be attributed to the different approaches inherent in the different assessment techniques. The teacher-assessment technique anchored on the assessment of learning approach where the progress in students learning is assessed while self and peer- assessment techniques anchor on assessment for learning approach where processes that support active learning are assessed.

Recommendations

After considering the findings of the study the researchers made the following recommendations:

1. From the pedagogical point of view, teachers should pay more attention to the self- and peer-assessment technique.
2. Curriculum and designer of textbooks should endeavour to include self-assessment and peer assessment practices in their end of unit exercises.
3. Teachers should be given training through workshop, seminar and conference on how to adopt an alternative assessment technique via self- and peer-assessment.
4. Teachers should be encouraged to see dialogue and co-construction of knowledge as a core part of their teaching conception. This will enable them to appreciate the importance of allowing students to share more fundamentally in the assessment processes.

Conclusion

The study aimed at determining how self-regulated learning can be improved through the use of self- and peer-assessment. On the basis of the findings of the present study, it was concluded that self, peer and a combination of self-and-peer assessment techniques are very instrumental to the improvement of self-regulated learning of the students while teacher-assessment technique is apparently very slow to the improvement of self-regulated learning.

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