

# The Use of Quality Formative Assessment and Students' Learning Achievement Gain in west Ethiopia University Classrooms

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## Abstract

*This study describes how the use of quality formative assessment in a university course contributes to learning improvement. There is an increased interest among educational researchers to determine improvement of student learning that result from assessment practices. Quality formative assessment includes formative feedback, self-assessment and peer assessment. The study followed a partially mixed sequential research design and applied a quasi-experimental intervention that lasted for six weeks where six educators applied quality formative assessment on lessons of a general psychology course for intervention group students (N= 191) in which the quantitative data were collected by formative assessment questionnaire and achievement test before and after the use of quality formative assessment. The qualitative data were collected by focus group discussions with the students. The students' pretest and posttest achievement scores were compared between the intervention (N =191) and the comparison (N = 187) groups. The quantitative analysis used t-test and biserial correlation and attested the presence of statistically significant difference between the two groups in the posttest score. Moreover, effect size estimate (Cohen's d) was used to provide a validation on the variation between the two groups on the posttest achievement score. Recommendations were made to promoting the use of quality formative assessment aiming at the improvement of student learning achievement in university classes.*

## Key concepts

Quality formative assessment, formative feedback, self-assessment, peer assessment, learning achievement

## I. INTRODUCTION

This study examined the contribution of a quality formative assessment that was integrated with teaching to improve students' learning achievement in a "General Psychology" course at three west Ethiopian universities. Quality formative assessment denotes the delivery of formative feedback by educators, peer-assessment and self-assessment, which contribute to the improvement in learning. Learning improvement refers to differences in the students' test scores before and after the use of quality formative assessment on lessons of the course.

At present, Ethiopia considers education and training as an instrument of development and poverty alleviation. To realize this, the country set educational objectives which reflect the needs of the society (MOE, 1994, pp. 7-8). In relation to university

education, one of the specific objectives incorporated in the policy states: "satisfy the country's need for skilled human power by providing training in the various skills and at different levels" (MOE, 1994, p. 9). In line with this, the country is rapidly expanding higher education, and student enrolment is also increasing (Higher Education Relevance and Quality Agency for Ethiopia (HERQA, 2008). Moreover, there is a national concern and dedication to improve the quality and relevance of university education. However, as a report by HERQA (2008) indicates students at universities have not been fully engaged in assessment practices, which can improve learning. Thus, this study integrated quality formative assessment on lessons of a course and found out the ways by which the students' learning achievement improves.

## Conceptual model

Conceptually, the constructivist learning paradigm was fundamental to inform this study, because the study examined the contribution of quality formative assessment to the improvement of learning achievement. Constructivist learning assumes the active involvement of students in learning and assessment tasks. Students make sense of new knowledge by mapping it to their existing knowledge and they see instruction not only as the transmission of knowledge but also as intervention in an ongoing knowledge construction process. Moreover, there is an opportunity for the students to actively involve as self-and peer-assessors. The provision of formative feedback also contributes to learning. As a result, educators consider formative assessment as an essential curriculum component that contributes to improved learning. Hence, the following statement explains the logic for the conceptual alignment of this study with the constructivist learning paradigm. "A quality formative assessment that is integrated with instruction, involving the students as self-assessors, peer assessors, when accompanied with feedback improves learning." Hence, this study raises an important research question that states, "What is the extent of learning improvement resulting from the use of quality formative assessment on lessons of a course?"

## Literature

Educators obtain information on the effectiveness of their teaching from assessment results (Yorke, 2003, p. 479). In their article entitled "Does your assessment support your student learning?" Gibbs and Simpson (2005, p. 4), refer to assessment as a means of providing information on how well students are learning and how they can improve performance in future learning. In particular, formative assessment plays a significant role to the improvement of student learning and achievement. It

includes feedback and focuses on how the students are changing in the learning process. Formative assessment is less formal and helps to improve instruction by guiding students. Although educators collect the results of formative assessment, they seldom use the information to report official grades or achievement standards (Nitko, 2004, p. 12). "What makes formative assessment, formative is its immediate use to make adjustments to form new learning" (Shepard, 2005b, p.5). Looney (2011, p. 21) defines formative assessment as "a frequent and interactive assessment of student progress and understanding to identify learning needs and adjust instruction appropriately." Formative assessment is used to identify the specific misconceptions and mistakes made by students while instruction is ongoing (Kahl, 2005, p. 28; Trumbell & Lash, 2013, p. 5). According to Clark, educators can design and use formative assessment "to encourage a real-time feedback loop between teacher and student and among peers." Hence, Clark (2011, p. 163), states that educators can design formative assessment in such a way that:

*... the students are able to understand clearly what they are trying to learn and what is expected of them, given immediate feedback about the quality of their work and what they do to make it better, given advice about how to sustain improvement, fully involved in deciding what needs to do next, and aware of who can give help if they need it and have full access to such help.*

Williams (2008, p. 398) believes in the power of formative assessment to produce unprecedented improvement in student learning and achievement gains. Consistent use of formative assessment can provide sufficient information to move learning forward (Heritage, 2007, p. 140). Bennet (2011) also asserts that the use of formative assessment improve students' knowledge and skills. However, there is a limited understanding and application of formative assessment in the teaching of university courses (Duckor, 2014, p. 29), despite the pressure to improve teaching and the quality of student learning assessment (Hattie, 2009, p. 15). Assessment is formative when the educator and the students use the information to make adjustment on the instruction to address the needs of students (Popham, 2006, p. 3). Shute (2008, p. 154) argues that the current assessment practices are problematic because the information from the assessment is not used to adjust teaching. In formative assessment, teachers can use the assessment information promptly to make instructional adjustments and inform new learning (Shepard, 2005a, p. 70). Yorke (2001, p. 478) also states the purpose of formative assessment as the provision of necessary information to modify and guide teaching towards improving instructional effectiveness and benefiting student learning. After examining 250 studies regarding current classroom assessment practices, Black and Wiliam (1998a, p. 36) recognise that formative assessment has a more profound influence on student learning than other typical instructional interventions, producing effect sizes between 0.4 and 0.7. Specifically, the authors assert the advantage of formative assessment practice for low-achieving students. Labay (2011, p. 5) considers formative assessment practice to be effective, for low achieving students. Thus, Black and Wiliam (1998a, p. 13) recommend the use of formative

assessment to narrow the gap between low and high achieving students while raising the overall level of achievement for all students.

Formative assessment increases students' motivation and involvement in the learning process. When students are "motivated and actively involved in the learning process," their learning can be improved (Looney, 2011, p. 7). In this regard, Labay (2011: 8) shows that student motivation and involvement provide clear information about what they know and can do, what still needs to be learned and how to reach the next steps on the pathway towards the learning objectives. Besides to this, the use of quality formative assessment encourages students to become learning-oriented, motivated in schoolwork, use more self-regulation skills and develop a deeper understanding of the subject matter they learn (Shepard, 2005b, p. 10). Another important use of formative assessment is the identification of the gap between what students have learned and what they should learn. Sadler (1989, p. 120), for example, believes the identification of the gap between student learning and some desired educational goals as one essential use of formative assessment. Recognition of the differences between what students know and need to know and where instruction will be most effective to meet the desired learning is the key in formative assessment practice (Brandt & Pinhok, 2009, p. 5).

Formative assessment is helpful for students to compare their assessment performance with the standard performance (Brookhart, 2003, p. 158). In relation to this, Brookhart (2003, p. 162) suggests the following three preconditions to help students benefit from the improvement of their learning because of formative assessment. First, students must understand the learning goals, second, students must develop the ability to monitor their work and compare actual with desired performance, third, students must develop the ability to act in such a way as to close the gap that involves setting their own learning goals. Here, the teacher's role is "to identify and build on immature, but maturing structures and, through collaboration and guidance," facilitate cognitive growth. Therefore, effective formative assessment identifies what the student can achieve on his/her own, "and with the help of the teacher or experienced" peer. This may enable the teacher to adapt the teaching to bridge the gap between the student's current state of learning and the desired state of performance (Heritage, 2007, p. 142).

Effective feedback provides clear, descriptive and criterion-based information that shows students where they are in a learning progression. In the claim of Heritage (2007, p. 142), "effective feedback shows how students' understanding differs with the desired learning goal, and how they can move forward." As Heritage (2007, p. 141) explains further, because of the feedback, the teacher takes "steps to bridge the gap between the students' current learning" and the intended learning by modifying instruction, assessing again, to provide further information about learning and modifying the instruction again. In addition, when students are involved in formative assessment, they can develop self-and peer assessment skills, which in turn, enable them to acquire knowledge of their present cognition and develop expectations for future improvement. For this purpose, the

students employ metacognitive processes, develop self-regulation tactics and adapt their learning techniques to meet needs (Heritage, 2007, p. 142). Popham (2006, p. 5) proposes four issues that can make a major difference in the educational payoff of formative assessment. These are:

*...involving students actively in the use of formative classroom assessments, distinguishing between formative assessments intended for teacher-use and those intended for student-use, constructing formative assessments so that the information they provide is maximally informative to the intended recipients and, having formative assessment's locus of control situated as close to the classroom as possible.*

Similar to the above, to ensure its use in the improvement of learning, Leahy, *et. al* (2005, p. 21) describe the main uses of effective classroom formative assessment as follows:

*...effective formative assessment clarifies and shares learning intentions and success criteria, generates classroom discussions, questions, and learning tasks, provides feedback that steps students forward, activates students as owners of their own learning, and activates students as instructional resources for one another.*

As the literature review shows, formative assessment contributes to learning improvement. However, pedagogical practices that encourage the use of quality formative assessment and student participation in assessment are still in the process of development (Rawlins, 2007, p. 72).

## II. RESEARCH DESIGN AND METHODS

This study situated itself within the pragmatic paradigm of studying a phenomenon, because the research question set, call for objective data from pretest and posttest scores as well as subjective data on the personal experiences of students obtained by focus group discussions. The pragmatic paradigm requires the mixing of quantitative and qualitative methodologies. The quantitative methodology is useful because the study followed empirical methods of data collection, analysis and interpretation of variables with quantitative characteristics through quasi-experimental procedures, which lasted two weeks for the pilot study and four weeks for the main study. The qualitative methodology is also useful to look into the complexity of research participants' perceptions.

As mentioned earlier, the objective of this study was to examine the extent of learning improvement resulting from the use of quality formative assessment on lessons of a course. Therefore, it was necessary to collect data from the group, who experienced the effect of the use of quality formative assessment. To achieve the objective, the study followed a mixed methods research design. Creswell, Clark, Gutman and Hanson (2003, p. 265), describe mixed method as a research design that integrates quantitative and qualitative data either concurrently or sequentially at one or more stages of the research process. In the present study, to supplement the quantitative data, qualitative data was collected based on a

sequential explanatory strategy. Specifically, the study followed a mixed method research design of the type partially mixed sequential dominant status in which a main quantitative study was sequentially followed by a qualitative study (Leech & Onwuegbuzie, 2007, p. 470). In this approach, the collection and analysis of qualitative data usually follows and supplements the collection and analysis of data with quantitative characteristics (Creswell, 2009, p. 211). In the present study, the researchers, first collected and analyzed the quantitative data, collected and analysed the qualitative data, and then mixed the two in the interpretation and discussion phases of the study (Creswell, *et al.*, 2003, p. 178).

In selecting the sample respondents for this study, the researchers used simple random sampling technique to identify students of intact classes for the quasi-experimental procedure. For instance, the selection of three universities which took part in the study was made by the lottery-draw method. From each of the universities included in the study, two entire classes of students who were enrolled for "General Psychology" course were randomly selected for inclusion in the intervention group. Two other classes taking a similar course to that of the intervention group were also identified as comparison groups to supply the quantitative data for the study. Therefore, the number of students who participated in the study was 464 including both the intervention and the comparison groups, of which only 378 (81.46%) sat for both pretest and posttest achievement tests. The sample size (n= 378) is representative of the student population (N = 6500) enrolled for "General Psychology" course at the six west Ethiopian Universities. The collection of data for this study was carried out in two steps. The first step was the collection of base-line data and pretest achievement scores before the quasi-experimental intervention. The baseline data included asking students whether formative assessment was practiced on lessons of the course. During the second step, data were collected by means of posttest achievement score, and focus group discussions.

The quantitative data outputs comprised both descriptive and inferential statistics. Descriptive statistics were used to present the students' scores from the pretest and posttest. The inferential statistics such as t-test, biserial correlation, and effect size estimate were used to determine the presence of statistically significant and valid variation between the students in the intervention and in the comparison groups on learning achievement. In fact, before this, analysis of the baseline data was done to establish the precondition for applying the quasi-experimental procedure in the form of instructions using quality formative assessment on lessons taught for the intervention group students.

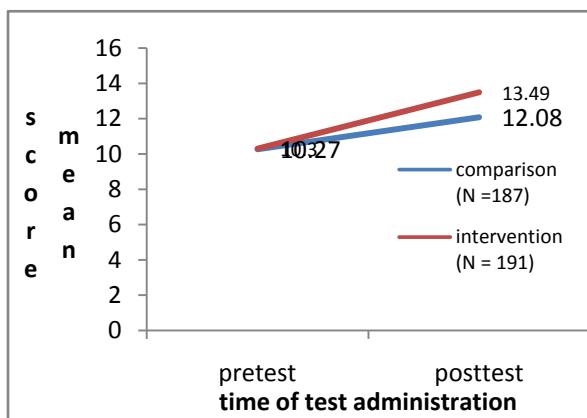
On the other hand, qualitative data analysis is practicable for answering "why" and "how questions" in research. For example, "How do students perceive the contribution of quality formative assessment to learning improvement? Since, it is mostly concerned with the complex nature of human behavior in a social context, qualitative data can be analyzed in different ways (Punch, 2005, p. 5). The specific method of qualitative data analysis followed in this study was the constant comparison method, for its relevance and simplicity when applied to several types of data



such as FGDs (Leech & Onwuegbuzie, 2007, p. 486). This method of qualitative data analysis is useful to identify the underlying themes emerging from the research data set. The researchers read through all the data before applying the method. After that, the data were organized into smaller chunks. Afterwards, every chunk of data was given a label with a describing code. After all the data had been coded, the codes were grouped in terms of similarity and themes were identified based on each grouping (Leech & Onwuegbuzie, 2007, p. 491). Finally, the themes were used for interpretation based on how they relate to the research question raised in the study.

### III. RESULTS AND DISCUSSION

The purpose of this study was to examine the extent of which the use of quality formative assessment improves student learning. Thus, it compared the learning gains between the students in the intervention and comparison groups after the former learned their lessons by the integration of quality formative assessment. The pretest and posttest scores of the two groups were compared after the instructional intervention. Increments in the mean achievement test scores were observed for both groups (see Figure 1 below). For instance, the mean score for the comparison group students (N=187) was 10.30 with a standard deviation of 3.65 and the mean score for the intervention group students (N =191) was 10.27 with a standard deviation of 3.73. This increased to 12.08 with a standard deviation of 3.11 and 13.49 with a standard deviation of 3.65 for the comparison and intervention group students respectively.



**Figure 1: Mean differences in the achievement test scores of the comparison and intervention groups of students**

The independent samples mean difference test (t- test) that assumed unequal variances (because of the instructional intervention to one of the groups) between the two score distributions, resulted in a statistically significant difference ( $t = 4.01, df = 376, sig. < 0.00$ ). This reveals the presence of significant achievement variation between the two groups after the use of quality formative assessment (see table 1 below).

Table 1: Achievement test score (post-test)

Gr	Mean scores	SD	Mean differ	T-value (table value = 1.96)	df	Assum.	Sig. p =.05	Remark
Intr	13.49	3.65	1.40					

Co m	12.08	3.11		4.01	376	Unequal variance	.000	There is a statistically significant difference
Intr	13.49	3.65	1.40					

On the other hand, the biserial correlation coefficient was computed between the achievement test scores of students as a continuous variable and the students' placement either in the comparison or the intervention group as a dichotomous variable. This correlation was computed to check out whether there was a statistically significant relationship between placement in the intervention group in which the students were taught by the use of quality formative assessment and the corresponding test score results. Therefore, in this study, the biserial correlation was found to be considerably higher ( $r_b = 0.26$  with degrees of freedom = 376), where the expected coefficient at  $\alpha = 0.05$  is less than 0.19. This shows, there was a statistically significant relationship between placement in the intervention group where quality formative assessment was used in instruction and the students' score from the achievement test.

Furthermore, the effect size for quasi-experimental intervention was estimated on the outcome variable. Effect size estimate is a more robust statistic used to compare the value of variables in quasi-experimental studies. Effect size helps to measure how much something, for example, (student scores) changes after a specific instructional intervention. The index shows the extent to which two populations do not overlap in a measure, or how much they are separated because of the instructional intervention (Aron, Aron & Coups, 2009, p. 205). The common ways of reporting effect size for quasi-experimental study designs are the raw score mean difference, the standardized mean difference and the odd ratio. For the sake of simplicity and convenience, effect size estimate methods of the first two (raw score difference and standardized mean difference) were used in this study. In the first case the estimated effect size resulted from the intervention was 1.41 score points. In the second case, the effect size estimate on standardized mean differences was 0.41, which means according to Cohen (1988) and the convention on estimates of effect size, this value is judged as a medium result for a quasi-experimental intervention where random assignment and control of study participants was hardly possible (Aron, *et al*, 2009). In this study, therefore, the instructional intervention that integrated the use of quality formative assessment produced positive gains on the students' learning and achievement.

On the other hand, the analysis of data from the FGDs confirmed the usefulness of quality formative assessment to the improvement of learning. According to the FGD discussant students, the use of formative feedback encouraged more learning to occur. The uses of self and peer assessment were also advantageous because they were motivating to stimulate active attention and involvement of the students in learning and assessment. In the students' opinion, self-assessment made them relatively independent on their learning. They also reported that peer assessment activities were conducive to student motivation and competition. Furthermore, the students expressed the usefulness of formative assessment to acquire more knowledge in

the subject, obtain clarity concerning the learning objectives, and also self-confidence in learning. The students also witnessed that the information given regarding the learning objectives on the lessons were stimulating to them. Finally, the students who participated in the focus group discussions were given a chance to explain the ways in which the quality formative assessment allowed them to demonstrate their understanding. In reference to this, the discussants mentioned the following points to explain how formative assessment helped them to understand their lessons: (1) The introduction of the lesson objectives and the assessment criteria were helpful; (2) Learning from mistakes was useful and motivating; (3) It helped to reduce errors in learning; (4) It promoted greater accuracy in the learning of difficult concepts; (5) Ensured the credibility of learning achievement. In summary, the use of quality formative assessment in instructions can make a salient contribution to the improvement of student learning and achievement.

### Discussion

Educators and policy makers at higher education are interested on the assessment activities that can improve learning (Banta, Graffin, Flataby & Khan, 2009). A number of study reports show limitations on current classroom assessment practices (Black & Wiliam, 1998a). The reports contend that current assessment practices encourage rote and superficial learning and overemphasize the grading function of assessment at the expense of the learning improvement function (Black, 2000, p. 408). In contrast, the literature indicates formative assessment as a major way of raising learning standards. Formative assessment plays a significant role in bringing learning gains. It produces remarkable improvement in learning achievement (Williams, 2008, p. 408). Significant learning gains can be achieved when quality formative assessment is used in classrooms (Black, 2000, p. 408). Nevertheless, the practice and understanding of formative assessment at the higher education context are still limited (Yorke, 2003, p. 485). The use of formative assessment can help students attain the learning goals better and also show ways of future learning improvement (Harlen, 2007, p. 11).

In the present study, the learning gains of the students whose teaching included quality formative assessment and those whose teaching did not include quality formative assessment were statistically significantly different. Other studies have also shown similar results. A study by Tesfaye (2012, p. 193) at Addis Ababa University (Ethiopia) indicates that students who were taught by the application of feedback intervention on lessons outperformed those taught by the conventional lecture method on a first year physics course. In similar ways, Black and Wiliam (1998a) analyzed 250 studies, which compared classroom teaching with and without the use of formative assessment and the results showed that the students taught by the integration of formative assessment on lessons scored higher on tests than those taught without formative assessment. A study by Bangret, Kulik, and Kulik (1991, p. 89) also show that, students who experienced frequent testing and formative assessment on lessons, on average scored 0.5 standard deviations higher than those who did not experience frequent testing and formative assessment. Another study by Fisher, *et al* (2011, p. 225) showed an instruction using formative assessment to result for significantly higher marks on

assessment and overall grades while contributing to good student grades in general.

In the current study, effect size estimation resulted in an acceptable size of the difference in the post-test achievement score between the intervention and comparison group students. Effect size shows the extent to which two populations do not overlap in a measure because of the quasi-experimental intervention (Aron, *et al*, 2009, p. 205). In this study, this was confirmed by the effect size of 0.41. The effect size for most quasi-experiment studies ranges from -0.4 to + 1.6 (Norman, 2003, p. 184). Black (1999, p. 124) reported an average effect size of 0.7 for 21 studies, which used formative assessment interventions to compare the learning gain of students quantitatively. This is a much higher effect size when compared to the result of the present study. According to the convention and suggestions made to determine the magnitude of effect size, the range between 0 and 0.20 shows a weak effect, the range from 0.21 – 0.50 shows a medium effect, the range from 0.51 to 1 shows a moderate effect, and an effect size estimate > 1 shows a strong effect (Cohen, Manion, & Morrison, 2007, p. 124). Thus, the effect size estimate in the present study can be judged as medium and can be raised by following a more rigorous (with a long duration) quasi-experimental intervention and through professional development schemes for university educators.

### IV. CONCLUSION AND RECOMMENDATIONS

Scholars in the field of educational assessment argue on several limitations of the current assessment practices at the higher education context. The existing practices are believed to encourage rote memorization and surface learning. Moreover, there is a great emphasis to the grading than to the learning improvement function of assessment at universities. Thus, the importance of using quality formative assessment on lessons is underlined, because it brings improvement to student learning and achievement. As the baseline data from the quantitative phase of the present study revealed, before the use of quality formative assessment there was no significant difference on the achievement of students in the two groups. This paved the way for implementing the quasi-experimental intervention. Considerable number of students who participated in the study reported either an absence or insignificant practice of formative feedback, self-assessment and peer assessment in the teaching of the “General Psychology” course. After the students’ placement in the intervention and comparison groups and use of quality formative assessment on the lessons to the former, comparison of score distributions and correlations show statistically significant variation in the learning achievement between the two groups. The effect size estimate reported was evidence to the instructional advantages of quality formative assessment. The result confirms that the students who were taught by the use of quality formative assessment outperformed those who were not taught by the use of quality formative assessment in the posttest score. Hence, the use of quality formative assessment can make a salient contribution to the improvement of student learning and achievement. Quality formative assessment, if properly used, will likely increase motivation, engagement to deep approach to learning, and increase achievement of marks on tests. Moreover, the students who participated in the FGDs reported positive perceptions

towards the instructional advantages to using quality formative assessment though they also noted the presence of several impeding factors for its effective implementation in the present context.

The findings on this study showed the use of quality formative assessment to bring about significant achievement gains on student learning. Therefore, department heads, course team leaders, quality assurance officers, educators and students at universities shall collaborate and work towards the promotion and use of quality formative assessment on lessons of university courses because quality formative assessment can have salient contributions to improve learning achievement. The evidence provided on the use of quality formative assessment to effect significant gains on student learning can be well considered both for the design of assessment courses offered to beginning university educators and on continuous professional development (CPD) trainings for experienced educators. Thus, Academic Development and Resource Centers (ADRCs) and the Higher Diploma Programs (HDPs) which are established for in-service staff training and skill development shall continuously organize trainings to prepare educators with the skills of using quality formative assessment in teaching. Particularly, short-term staff development programs in the areas of instructional skills shall give due emphasis on the specific skills to using quality formative assessment namely formative feedback, self-assessment and peer assessment in the teaching of a university course.

Furthermore, educators shall practice instructions which involve the use of quality formative assessment aiming at developing the students' learning skills, learning to learn (L2L) because this will help to prepare the students for work place competencies and lifelong learning. To realize this, increasing the active role of the students in the instructional activities need to be emphasized by university educators.

On the other hand, courses and programs which incorporate the use of quality formative assessment should be planned and implemented in a way to prepare the students to become more responsible, reflective, and autonomous in their learning and assessment activities. Parallel to this, quality assurance personnel at the college level together with the mentors for the team learning groups should strengthen the already initiated collaborative learning practice (five students in a team) to contribute for improved learning and assessment practices in the teaching of university courses. In addition, quality audit protocols and practices for higher education courses, both by the respective universities and external quality councils (such as HERQA) shall enforce the presentation of evidence on how the course educators at the universities implemented quality formative assessment in the delivery of courses. Correspondingly, the educators teaching and assessment performance evaluation forms, which are filled out by the students and the department heads at the end of each course delivery should include sufficient items which can measure whether the course educator has properly implemented quality formative assessment on the teaching of courses. Finally, a more rigorous quasi-experimental research that aims at the replication of the evidence presented and the methodology used shall build on this study. As the practices of using quality formative assessment on lessons of university courses are not well

developed, more evidence on the effects may attract attention and promote the practice to improve student learning and achievement.

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