M.K. AMEDEKER

6. THE CONTRIBUTIONS OF CONTINUOUS ASSESSMENT TO THE IMPROVEMENT OF STUDENTS' LEARNING OF SCHOOL SCIENCE

A Case of Ghana

INTRODUCTION

Information obtained from continuous assessment may be used for summative or formative purposes. While one purpose may not be more important than the other, caution should be exercised in their use so that one is not compelled to obliterate the other. In school assessments, teachers may wish to use regular tests which they term as continuous assessment to find out about students' learning but Black and Wiliam (2003) are of the opinion that the current approach of giving frequent short quizzes and the types of questions used are not supporting students' learning. They argue that these frequent tests which are for summative purposes are not providing the guidance needed by students for their daily learning. Black and William (2003) thus suggest that teachers need to modify their classroom practices to include formative assessments which are known to have the potency of helping students to gain full control over their learning. This chapter argues that traditional African education is imbued with lots of philosophical learning and assessment strategies such as folklore, story-telling, proverbs and cultural rites that when incorporated into school science would improve its learning and assessment.

THE PRACTICE OF QUALITY CONTINUOUS ASSESSMENT

Classroom assessment or continuous assessment is the preserve of the teacher (Jones, 1998) as assessments are part of the routine of classroom activities. The teacher designs quizzes, short answer objective tests, portfolios among many other instruments for investigating students' learning. According to Jones (1998), an ideal educational system would ensure that teachers develop their instructional materials and assessments concurrently so as to achieve a sound balance between curricula, teaching activities and assessment. Tytler (2003) has indicated that one of the strategies for effecting good classroom practices is to integrate assessment and instruction. This presupposes that classroom assessment should not be considered as a separate entity from the routine activities of teaching. In practice, this ideal proposition appears far from real in Ghanaian junior high school science teaching as

A. Asabere-Ameyaw et al., Indigenist African Development and Related Issues, 91–100.

teachers treat the curriculum, teaching activities and assessment as separate entities and develop them at different stages of their preparation for instruction (Amedeker, 2007).

In the 1970s and 1980s, in England, some research projects that investigated ways in which teachers' classroom assessments were used found that some teachers used class tests to find out students' scientific reasoning and or science concept formation without using such results for the overall assessment of students (Black & Wiliam, 2003). Other studies that directed attention to classroom assessments and teachers' role in the classroom (Tunstall & Gipps, 1996; Torrance & Pryor, 1998) have revealed that classroom assessments were not used to support students' learning. Since then, a number of researched articles reviewed concerning the use of assessment for formative purposes have indicated that formative assessment does in fact support students' learning (Black & Wiliam, 1998).

Popham (2006) has noted that as all school curricula require that students master some skills and knowledge, teachers should analyse the curricula and compose different assessment tasks that would help students' learning. Involvement of students in assessment is central to the reform process of changing assessments from their summative to formative use. Stiggins (2004) has advocated that teachers should create new ways of involving students so as to enable students to use assessment to understand ways by which they would improve their learning. Similarly, Burns (2005) calls upon teachers to increase their interactions with students by using thought-provoking questions to engage students in formative assessments so as to obtain the reasoning behind students' thoughts as well as to engage them in meta-cognition.

A number of national policy documents on education reforms in Ghana express the belief that assessments play important role in improving teacher effectiveness and subsequently students' learning output. For example, the policy document titled *Ghana Vision 2020: Programme of Action for the First Medium-term Plan* (Government of Ghana, 1998) contains aspects of Government's plans that aimed at improving basic education through improving assessment in the schools. The document states, among other things "To develop and implement an effective learning assessment system that will accurately measure student performance and instructional effectiveness" (Government of Ghana, 1998, p. 30).

A second policy document, titled *Basic Education Sector Improvement Plan* (Ministry of Education, 1996a), stipulates that improvements in the quality of teaching depends, among other things, on the "development of an assessment and evaluation system of pupil performance" (p. 17). Also some of the improvements to be undertaken include writing and revising of textbooks, workbooks and Teachers' Handbooks which will have sample exercises, questions and projects for pupils. The document further gives the purpose of continuous assessment as to improve teaching and learning. In effect, instruction and continuous assessment were to be linked. This was to be realised through the organisation of in-service and pre-service training for teachers and was stated as:

> The continuous assessment system will be re-designed and implemented and results/findings will be the basis for remedial work for better output of work for both pupils and teachers. This will streamline the present system of recording continuous assessment marks and make the process less cumbersome and less time consuming (Ministry of Education, 1996a, p. 23).

A third document, *Guidelines for the Implementation of Educational Reforms in Schools* (Ministry of Education, 1996b), outlined the Government's approved policies for implementation of education reforms based on the report of the Education Reforms Review Committee (ERRC) appointed by the Government in July, 1994. The government endorsed the following recommendations related to assessment:

i. Continuous Assessment should continue to form a component part in determination of the performance of pupils at both BECE and SSSCE
ii. Continuous Assessment should take 30% and the External Examination 70% instead of the present 40% and 60% respectively.
iii. Since Continuous Assessment (CA) is more suitable for practical subjects than the one-shot assessment conducted by WAEC, schools should use CA more often for assessing their students in the practical subjects or practical components of other subjects than they have been doing.

(Ministry of Education, 1996b, pp. 7-8)

The junior secondary science syllabus outlines the learning outcomes (Dimensions of learning) that teachers of science should assess as *Knowledge*, *Understanding*, *Application of knowledge*, *Process skills* and *Attitudes*. The syllabus states that tests should have specified weightings for the dimensions such as "*Knowledge and Understanding* (30%), *Application of knowledge* (40%) and *Attitudes and Process skills* (30%)" (Ministry of Education, 2001, p. ix). The continuous assessment was to comprise projects, class tests, homework and terminal tests. The tasks given to students may comprise objective items, structured open-response questions and practical questions. The syllabus also encourages teachers of science to prepare marking schemes to guide marking of their students' test scripts and give marks and/or grades to represent the students' performance. Teachers were encouraged to write feedback about students' work, giving them points they should consider to improve their future performance. Additionally, the syllabus recommended some ego-oriented feedback such as "keep it up", "has improved", "could do better", "hardworking", "not serious in class" and "more room for improvement" (Ministry of Education, 2001, p. xvii) as examples of what teachers should write on students' exercises.

These documents did not elaborate on the changes outlined in the literature for the re-design of continuous assessment systems for use in teaching so as to help to improve students' learning. For example, the role of feedback in the enhancement of students' learning and that the most important feature of feedback is its focus on what students will be able to do and directions as to what they should do (Butler, 1987, 1988; Ryan & Deci, 1989; Wiliam, 1998;). Feedback may be task-oriented

or ego-oriented. The former is one that encourages students to show interest in a given activity and its mastery while the latter tends to orient the student towards the self rather than the activity (Butler, 1987). Further, none of the documents stressed the roles of diagnostic and formative assessments. Yet, it is known that assessment systems in the schools can be effective only when the diagnostic and formative components are also included (Black & Wiliam, 2003). These two forms of assessment assign definite roles to both teachers and students for the achievement of teacher effectiveness and high students' learning achievement. The teacher is a facilitator, mediator and a counsellor who diagnoses students' learning problems and provides feedback necessary for use by students to correct their learning problems. Students are sense makers of the feedback given as they reconstruct knowledge (Osborne & Wittrock, 1983) out of the new situations presented to them. This chapter, therefore, illustrates how indigenous African concepts of education may be used to re-design the continuous assessment system in science teaching and learning in schools so as to improve teacher performance and student learning achievement.

THE ROLE OF INDIGENOUS AFRICAN CONCEPT OF EDUCATION

The current educational systems found in various African countries were inherited from colonial masters who invariably imposed their cultures on the educational systems in Africa. This imposition appears to obliterate the inclusion of African philosophy in current African educational practices. Traditional African education has been both informal and formal. The informal education is mostly oral education and is intended to be life-long learning experiences while formal education involves apprenticeships and hands-on practice that lasts over a period of time. This cultural paradigm did not enforce the notion of building permanent four-walled classrooms in which education took place but rather ensured that education was pervasive and obtained everywhere in the society.

Informal African indigenous education is propagated through proverbs, story-telling, songs and plays. The African child was taught social values such as etiquette, mental processes and morals. For example, stories told by adults are imitated and repeated from one generation to another so by the time the child becomes an adult the stories are internalised. Thus, by adulthood such education provides mental training as well as imbuing the child with the morals of the stories (Marah, 2006). The mental dexterity of Africans who underwent this type of informal education has been described by Marah (2006) in the words "there were griots 'walking dictionaries', historians, or verbal artists who memorised the history, legends of a whole people and would recite them and teach their apprentices, or audiences, publicly or privately" (p. 18). Similarly, African traditional education through proverbs warns against impropriety in acquisition of knowledge. A Swahili proverb translates like "knowledge without good deeds is like a beehive without honey" (Abubakar, 2011, p. 70). A proverb from the Ewe people of Ghana translates 'knowledge is like the baobab tree and no one can wrap the hands fully around it'. This indicates that

knowledge does not reside in one person and may be obtained from one's neighbours through lifelong learning processes. Thus students' should bear in mind that they would learn from their colleagues.

African formal education provides skills through activities like dancing, rituals and role-modelling and vocational activities. A number of activities require that the youth come together and work as a team to achieve their life goals, thus encouraging the spirit of communalism. For example, there is the 'abusa' among the Akan speaking people of Ghana, which encourages people to rally round help to build houses or make farms for individuals in the community. This intones cooperation, an attribute that can be used in the form of cooperative and collaborative learning in schools.

TEACHERS AS EDUCATORS AND ASSESSORS

In this study, data were collected from 158 junior high school science teachers through questionnaires and interviews. This was to find out about their practices as professionals who were engaged in instructing and assessing students in science. The cardinal goals of traditional African education are centred on development of the child's latent physical skills, intellectual skills, character, specific vocational skills and acceptable attitude towards honest labour (Fafunwa, 1982). This chapter, thus, examined junior high school science teachers' assessment practices to determine whether they were using continuous assessment to promote the development of the child. Further, the author suggests the adoption of some of the elements of traditional African education discussed in this chapter into modern-day educational practices as a strategy for the development of the educational systems in Ghana and Africa as a whole.

Science Teachers' Purposes of Continuous Assessment Practices

The findings from the questionnaire are administered to junior high school science teachers are summarised under two main headings and analysed as in Table 1.

From Table 1, it is observed that a large proportion of the responses indicate that the teachers in this study were not using continuous assessment for counselling and remediation purposes. This implies that their students would not derive the maximum benefit from continuous assessment. Also a substantial proportion of the teachers were not using continuous assessment to assess their own efficiency in the delivery of their lessons. However, traditional African education makes provision for an apprentice system in which at the end of apprenticeship of acquisition of craft and skills, the graduate is observed and required to show obedience to the master and their seniors in order to acquire self-improvement skills (Omolewa, 2007). Also, the end of apprenticeship implies an entry into a new age group and that goes with responsibilities, accountability and privileges which must be appreciated by every graduate. Thus the master-craftsmen assess their efficiency through the performance of their apprentices.

Table 1. Teachers' purposes for continuous assessment (n = 158)

Teachers' knowledge of…	*Number of responses*	*Per cent of response*
Purposes of Continuous Assessment		
Identification of how much students know	99	62.7
Grading, reporting and placement	50	31.6
Counselling/remediation	42	26.6
Assessing teacher efficiency	33	20.9
Knowledge of characteristics of quality assessment tasks		
Validity of tasks	58	36.7
Reliability of tasks	47	29.7
Fairness/equity of tasks	46	29.1
Comparability of tasks	43	27.2
Authenticity of tasks	21	13.3

Note: Some teachers gave more than one response for the purposes of assessment

The analysis of data found in Table 1 also indicates that majority of the teachers in the study had limited knowledge of quality assessment tasks. In traditional African education, there abound specialists like "gold and ironsmiths, skin workers, weavers, wood workers, spirit mediums, specialists in medicine, witchcraft practitioners, psychiatrists, healers, circumcisers, musicians, storytellers, historians, etc." (Omolewa, 2007, p. 602). These are specialists who have good knowledge of the quality of tasks of their professions. Such knowledge acquisition is achieved through self-submission and devotion of the learner to the services of the teacher. Thus, it suggested here that modern learners should acquire these virtues and that teachers should ensure that their students submit themselves to discipline of learning and practising of skills in advance of assessments.

Learning Outcomes Assessed by Science Teachers

The results of the types of learning outcomes assessed by the teachers are shown in Table 2 in terms of number and per cent of responses.

The exercise books of 24 students were randomly selected from 13 different classes, mostly two per class and a checklist was used to determine the learning outcomes assessed by the teachers in the study. It is seen from Table 2 that the percentage responses indicate that a lot of the teachers were not assessing process skills and attitudes of the learners. However, these two learning outcomes stand out as core values required of holistically educated persons who are well-prepared to

Table 2. Learning outcomes assessed by science teachers (n = 156)

Category of teachers' responses	*Number of responses*	*Per cent of responses*
Understanding	106	67.9
Knowledge	97	62.2
Application of knowledge	96	61.5
Science process skills	65	41.7
Attitudes	27	17.3

Note. Some teachers gave more than one response. Two teachers did not respond to this item

make significant and meaningful contributions to their societies (Balogun, 2008). In describing the importance of process skills in training of the youth through traditional African education, Marah (2006, p. 17) indicates that "boys observed and imitated their father's craft and learned practical skills which they performed according to their capacities, as they matured into manhood". Thus, if science teachers are to give training that would equip our youth with skills that would enable them to perform usefully in contemporary society, then they would need to adopt the traditional training to bequeath the youth with practical skills.

RATING OF TEACHERS' ASSESSMENT PRACTICE

The tasks that the science teachers gave to their students and the way the assessed them, as evidenced in the students' exercise books, have been analysed with a 20-item checklist and rated on a three-point scale of *No evidence* = 1; *Weak evidence* = 2; *Clear evidence* = 3. The median scores for the type of task and assessment practice were determined and the results are summarised in Table 3

Table 3: Rating of teachers' assessment practice seen in students' exercise books (n = 13)

Characteristics of tasks and assessment practices	*Median score*
Tasks related to objectives	3
Learning outcomes adequately sampled	2
Tasks assess knowledge	3
Tasks assess comprehension	3
Tasks assess application of knowledge	2
Tasks assess science process skills1	1
Detailed comments on marked scripts	1
Tasks are relevant to students/familiar contexts	2

The median is a central tendency of measurement which is most representative of the distribution of the marks obtained in totalling up each teacher's marks for an item. The marks distribution is asymmetric so it is most appropriate to represent the central mark with the median. From Table 3, it is observed that Items 2, 5, 6, 7 and 8, which are concerned with learning outcomes, application of knowledge, process skills, giving feedback on students' tasks and relevance of tasks to students, respectively, had no clear evidence of having been fulfilled. The learning of science in schools today may be compared to the vocational training given in traditional African education to the youth. The master craftsmen under whose tutelage the adolescent African youth learnt, assessed their skills by watching them perform assigned activities. Though no formal grades were given, the master craftsmen directed their apprentices by a series of comments on their works until the apprentices became perfect in performing particular skills. Today's science teachers should take cue from traditional training of the youth so as to lead students through relevant practical skills acquisition.

Interview Results

The results of the focus group interview held for six of the science teachers corroborated the findings from questionnaire data that majority of the science teachers had limited knowledge of administering effective continuous assessment. It was also revealed that the teachers had limited knowledge of the profile dimensions which are the learning outcomes expected of students and also how to plan assessment while planning lessons. Thus, their lessons were likely to lack the formative assessment required to enhance students' concept development in science (Black and Wiliam (2003).

The focus group discussion with students revealed that their continuous assessment were mainly class tests and take-home assignments. It was also revealed that the feedback they received were not task-oriented as they said their teachers wrote words such as 'excellent', 'keep it up', 'poor', 'see me' in their exercise books when they marked them. These revelations were evident during the inspection of the students' exercise books as feedback seen in them were marks and some few comments that either praised the students or admonished them for not being serious with their work.

CURRICULUM AND POLICY DOCUMENTS

Though the junior high school syllabus and the official policy documents expressed the need to improve teaching through improvements in the assessment systems, they did not elaborate on the changes expected in the re-design of the continuous assessment system and the implementation procedures. None of the documents stressed the role of diagnostic and formative assessments in teaching. This implies that teachers who implement continuous assessment would not have guidance on new strategies needed to integrate instruction and continuous assessment to improve students' science learning.

CONCLUSION

The study used teacher questionnaires and interviews with teachers, students, teacher educators and education officers, policy and curriculum document analysis, and samples of students' exercises to collect baseline data on the implementation of continuous assessment and purposes of continuous assessment. The findings show that continuous assessment is separated from instruction as the teachers indicated that they did the continuous assessment as a series of homework, class work and class tests. Thus, the teachers used continuous assessment mostly for summative purposes with little or no feedback to students. The curriculum and policy documents were not explicit on the procedures that teachers should use to incorporate assessment into their instruction so as to enhance teaching and students' involvement. It was also found that most of the teachers had no training in assessment and lacked assessment literacy as they had limited knowledge of purposes of continuous assessment and characteristics of quality assessment tasks. The practice of continuous assessment is thus teacher-centred as teachers only prepared tasks for assignments and tests but not for involving students during instruction. The challenge is, therefore, thrown to education authorities to design policies that would enable science teachers to use continuous assessment to enhance students' science learning and science concept development. Also, teachers need to be educated on how to integrate assessment and instruction so as to enable them to use a combination of diagnostic, formative as well as summative assessment at various stages of their lessons to help students' science concept development. The strategies of proper documentation of clear policies and guidelines on continuous assessment and teacher professional training on continuous assessment is the way forward for confronting the challenges of implementation of continuous assessment. This chapter, therefore, suggests that a cue should be taken from traditional African education, which makes provision for continuous assessment in the education of members of the society.

REFERENCES

Amedeker, M. K. (2007). *The status and quality of continuous assessment in junior secondary science in Ghana*. Unpublished doctoral thesis presented to Edith Cowan University. Perth, Western Australia.

Balogun, O. A. (2008). The idea of an Educated Person in contemporary African thought. *The Journal of Pan African Studies*, *2*(3), 117–128.

Black, P., & Wiliam, D. (1998). Inside the black box: Raising standards through classroom assessment. *Phi Delta Kappan, 80*(2), 139–148.

Black, P., & Wiliam, D. (2003). In praise of educational research: Formative assessment. *British Educational Research Journal, 29*(5), 623–637.

Blake, C. (1993). Traditional African values and the right to communicate. *Africa Media Review, 7*(3), 1–17.

Burns, M. (2005). Looking at how students reason. *Educational Leadership, 63*(3), 26–31.

Butler, R. (1987). Task-involving and ego-involving properties of evaluation: Effects of different feedback conditions on motivational perceptions, interest and performance. *Journal of Educational Psychology, 79*, 474–482.

Butler, R. (1988). Enhancing and undermining intrinsic motivation: The effects of task-involving and ego-involving evaluation on interest and performance. *British Journal of Educational Psychology, 58*, 1–14.

Fafunwa, A. B. (1982). African education in perspective. In A. B. Fafunwa & J. U. Aisiku (Eds.), *Education in Africa: A comparative survey* (p. 270). Wichester: Allen & Unwin, Ltd.

Government of Ghana. (1998). *Ghana vision 2020: Programme of action for the first medium term development plan (1997–2000)*. Accra: Ministry of Education

Jones, R. W. (1998). Overcoming an all-too-common problem: Solving the mismatch between science curricula and assessment. *Australian Science Teachers Journal, 44*(3), 19–29.

Marah, J. K. (2006). The virtues and challenges in traditional African education. *The Journal of Pan African Studies, 1*(4), 15–24.

Ministry of Education. (1996a). *Basic education sector improvementprogramme policy document Vol. 1*. Accra: Ministry of Education.

Ministry of Education. (1996b). *Guidelines for the implementation of improved school education reforms programme.* Accra: Ministry of Education.

Ministry of Education. (2001). *Teaching syllabus for science: Junior secondary school.* Accra: Curriculum Research and Development Division.

Omolewa, M. (2007). Traditional African modes of education: Their relevance in the modern world. *International Review of Education, 53*, 593–612.

Osborne, R. J., & Wittrock, M. C. (1983). Learing science: A generative process. *Science Education, 67*(4), 489–508.

Popham, W. J. (2006). All about accountability: Those [fill-in-the-blank] tests! *Educational Leadership, 63*(8), 85–86.

Ryan, R. M., & Deci, E. L. (1989). Bridging the research traditions of task/ego involvement and intrinsic/extrinsic motivation: Comments on Butler (1987). *Journal of Educational Psychology, 81*(2), 265–268.

Stiggins, R. (2004). New assessment beliefs for a new school mission. *Phi Delta Kappan, 86*(1), 22–27.

Torrance, H., & Pryor, J. (1998). *Investigating formative assessment.* Buckingham: Open University Press.

Tunstall, P., & Gipps, C. (1996). Teacher feedback to young children in formative assessment: A typology. *British Educational Research Journal, 22*, 389–404.

Tytler, R. (2003). A window for purpose: Developing a framework for describing effective science teaching and learning. *Research in Science Education, 33*, 273–298.

Wiliam, D. (1998). *Enculturating learners into communities of practice: Raising achievement through classroom assessment.* Paper presented at the European Conference on Educational Research, Ljubljana, Slovenia.