

Is Effective Teaching and Learning the Solution to Quality Management of Massification in Science-Based Faculties? A case of Gulu University, northern Uganda.

Abstract

In higher education and in education generally, the quality of teaching and learning is paramount. Teaching and learning are key elements of any education system without which there is no legitimacy for any educational institution. In this research, quality teaching and learning of practical science discipline is the main focus against a backdrop of the rapid transformation sweeping the higher education sub-sector globally resulting into a situation of massification; where the ratio of educational resources and class numbers become incompatible, giving rise to the poor quality standard (Mohamedbhai, 2008). Furthermore, massification is assumed results into stressful learning conditions for both the lecturers and learner, and the loss of quality and or lowering of standards. Using qualitative and quantitative research paradigms, the survey, single-case and parallel cross-sectional designs, this study was done involving 294 respondents out of the 395 sampled populations. The sampling techniques used were purposive, random and stratified. Data was collected through closed ended structured questionnaires, oral interviews, direct observations, focus group discussions and search into archival records. Analysis was by use of descriptive statistics. Major findings indicated that the quality of teaching and learning in the science-based faculties at Gulu University is eroding because of massification and can be mitigated by effective teaching and learning.

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Key words: Teaching and Learning, Massification, Quality, Management.

Introduction

Globally Higher education participation and enrolment has expanded considerably over the past century. According to Calderon, A. (2012), growth predicted over 30 years from 2000-30 is likely to be higher than that experienced between 1970 and 2000. The number of students enrolled in higher education by 2030 is forecast to rise from 99.4 million in 2000 to 414.2 million in 2030 – an increase of 314%. Today higher education is not only viewed as an avenue to create knowledge, but also as a business-like enterprise. *The Economist*, 2005 (cited in Mohamedbhai, 2008), advanced four main reasons for this explosion, viz; the democratization of education, the rise of the knowledge economy, the phenomenon of globalization which is turning higher education into an export industry, and competition for students, funds and research grants. This quantitative increase in enrolment resulted into situation of massification where the ratio of educational resources and class numbers become incompatible giving rise to poor quality standard (Mohamedbhai, 2008). Amidst this quagmire brought about by massification, quality management of teaching and learning in science disciplines therefore becomes critical because a scientifically literate population is the backbone of sustainable development (UNESCO, 2002).

Teaching, learning and assessment are processes through which educational objectives and goals are achieved. They serve the aims of education, which amongst others is acquisition of knowledge, skills, habits, values or attitude (World Book Inc, 1994), which should cause an enduring change. Teaching, learning, assessment and their effective management form core facets of any education system.

Quality management of teaching and learning will thus be viewed: First as a process of getting activities completed efficiently and effectively with and through other people; secondly as a

process of setting and achieving goals through the execution of the basic management functions; planning, organizing, staffing, directing and controlling which in operational principles puts management into three components (plan, execute and measure). At higher education the implementation of these management strategies are guided through a number of legal frameworks and policies, viz: the University and Other Tertiary Institutions Act, the Semester and credit system regulations, the programme guidelines as well as the assessment regulations which should inform the conduct of the teaching-learning process.

According to Shaeffer (1992), quality in education was traditionally defined in terms of inputs, outputs and processes. Inputs including materials; class building, desks, chalkboards, textbooks, laboratory equipment as well as teachers and students whose quality is often measured in terms of qualification of teachers, text books relevance and students' intellectual and nutritional status. Outputs on the other hand include; proxies of achievement (i.e. promotion and completion rates) and measures of actual achievement such as the kind and quantity of facts and skills learned. More recently, Shaeffer (1992), viewed quality in terms of proper organisation of a lesson/lecture, the correct use of texts and home work/assignment, the encouragement of child-centred learning, the absolute amount of time spent on tasks and so on.

In B-HERT NEWS (2003), renowned educationists had the following to comment about the importance of teaching and learning at university education. Here are excerpts:

According to Prof. Craig, M. (2003), Centre for the study of Higher Education in the University of Melbourne, the importance of teaching and learning in universities has shifted from routine and somewhat token acknowledgment in government policy to a central place in the higher education policy agenda. To him, students are now more likely to study in multiple settings: in large lecture theatres, in groups on collaborative exercises, in computer laboratories with two or three others in an online tutorial, or simply working at home alone. Whereas it may be true that these learning strategies help to improve quality teaching and learning, it is important to observe that their implementation remain wanting in most higher institutions of learning and should be re-enforced, consolidated and tailored especially in the management of massification in the science-based disciplines.

Professor Dawkins, R. (2001) of the University of Oxford, however, believes that the Oxford Tutorial is better than any alternative offer, because it emphasises the virtues of individual attention, and the one-to-one focus on learners. Mr Robin Lane Fox, Fellow in Ancient History new College, Oxford and admirer of the Socratic Method also think that the Oxford tutorial system is the best because it brings one or two learners into contact with a single teacher in their subject and provide them an opportunity to think together. It is also believed that the Oxford tutorial system also received a positive applaud from the students, thus: "tutorials continue to play a prominent part in the life of any student at Oxford and there is no doubt that they think about them a great deal, how they work (and sometimes do not work) as a way of learning and teaching." The learners further commented that there is a danger that with the decline of one-on-one teaching, the opportunity to offer the kind of detailed, in-depth advice to an individual that was always a distinctive feature of the traditional tutorial is lost.

On the part of the Learners, many factors shape the quality of learning. These include the aptitude and motivation of individual students and their own approaches to learning (including collaborative learning), the quality and diversity of the student body of which they are part, the curriculum they study, the calibre and strategies of those who teach them, the size and nature of their classes, the ways in which learning is encouraged by assessment processes and feedback, the learning resources (such as libraries, laboratories, and information technology) available and used, the scope for learning in the classroom to be enriched by learning outside the classroom (including in residential and extra-curricular settings), and the wider institutional and social context.

According to Biggs (2003) reviewed by Paulo and Bota (2004), quality of teaching in higher education relies upon what students do both in and outside the classroom. He claimed that at last a shift occurred in the focus of teaching and learning from what teachers do to what students do in the classroom in higher education. He argued that this shifting is liberating. The main theme of his paper was that the quality of teaching can be enhanced by aligning objectives, teaching styles and assessment tasks.

The Visitation Committee on Public Universities in Uganda (2006) while addressing itself on methods of teaching and assessment, clearly expressed regrets that most lecturers in Ugandan universities are still using old and traditional teaching methods – talk and chalk lectures, tutorial/seminars and demonstrations in labs, workshops and in the field...these teaching methods are more teacher-based than student-based and they tend to develop students' memorization rather than their analytical and problem-solving skills. In the study the researcher intended to find out how the input, output and process conditions; (class building, lecture chairs, whiteboards, chalkboard, textbooks, laboratory equipment, teachers and students quality, text books relevance, organisation of lectures, use of child-centred approach in teaching, the absolute amount of time spent on a task as well as the use of ICT) in the teaching-learning conditions at Gulu University in the selected departments were applied to manage massification.

Cognizant of the aforesaid therefore, and whereas some of these studies were carried out at lower levels of education rather than at higher education, and conscious that in higher education, approaches to learning are multivariate and augmented with tutorials, research, library work and outreach services, the general consensus seems to point to the fact that teaching and learning remain core functions in the education setting to which keen attention must be placed. To surmount the challenges therefore, managers of education at all levels and especially at higher education were advised in this study report to attempt to draw some operational strategies and more especially in the management of massification which is turning into a new challenge that needs to be addressed if attainment of quality education has to be realized in line with expectations of the NCHE standard parameters.

The Conceptual Underpinning

According to Kajubi, S. (1997), massification refers to the diversity of institutions and programmes, escalating expansion and widening of access to tertiary education and the large increase in numbers and size of universities. Mohamedbhai (2008), on the other hand refers to massification as that situation of inadequate and stagnant educational infrastructural growth and

other educational resources against an increasing students' population. Massification may have both positive and negative consequences. Mohamedbhai (2008) opined that massification is positive for an institution when the institution has adequate physical, human and financial resources to cope with the rapid increase in enrolment and diversity of programmes and to produce quality outputs and outcomes, and negative when an institution is bogged-down to unplanned diversification of programs, high enrolment rates, inadequate education resources and infrastructure, high student-teacher ratio, just to mention a few. This state of affairs will inevitably have a direct bearing on the quality of education offered as well as on the output and outcomes of the graduates unless addressed under the principles and practice of managerial functions-planning, organizing, directing, commanding and controlling.

Statement of the problem

Gulu University, like any other institution of higher learning in Uganda experienced rapid growth in students' numbers over the years. These escalating numbers and sometimes unplanned progress led to the imbalance between students' numbers and the availability of education resources (massification) which impacted negatively on the teaching and learning of science disciplines at the University. The situation in the science-based departments at Gulu University depicted that the growth in educational facilities or other educational resources were not commensurate to the growth in students' numbers. The situation was assumed resulted into stressful learning conditions for both the lecturers and learners. The study was thus carried to investigate the extent to which Gulu University managed the challenges of massification in the science-based faculties guided by the National Council for Higher Education (NCHE) quality benchmarks for the overall improvement of the educational standards.

Methodology

The study used both qualitative and quantitative research paradigms. A survey research design, single-case and parallel cross-sectional type was used to gather information from the Respondents. The single case design was chosen because it is very useful in exploring and understanding a uniqueness or exceptionality of a case. The choice of the parallel cross-sectional survey design was owing to its ability to use different categories of respondents at a given point in time (Odiya, 2009). The study design provided opportunity for the variables to be measured under the same conditions and for the categories to be given the same or similar instruments. This design was preferred amongst others because its findings can be generalized to a larger population.

Study Population

According to Mugo (2011), a population is a group of individuals, persons, objects, or items from which samples are taken for measurements, for example a population of presidents or professors, books or students. In this study the population included: the Corporate Management, the Decentralized Management, the Collegial Management, the Students and other stakeholders from the public. The Corporate Management comprised: Council Chairperson, Vice Chancellor, Deputy Vice Chancellor, University Secretary and Academic Registrar. The Decentralized Managers comprised: The Deans of Faculties and Heads of Departments. While the Collegial Managers comprised: the Professors and Lecturers. Information was also collected from Students of three Science-based faculties: Human Anatomy, Computer Science and Bio-system

Engineering. More information was collected from the public and at least ten reputable institutions.

Data Analysis and Interpretation

Plooy (2007) defined data analysis as a process of bringing order and structure to the mass of collected data. In the study, qualitative data from the various sources were sorted, summarized, analyzed and interpreted into a format from which meaningful conclusions were drawn according to how they answered the research questions. Similarly, quantitative data scores were organized and coded by assigning numbers to the responses of items in the instruments. By use of chi-square test, results were computed and analyzed. Frequency tables and multiple response tables were also used to summarize the responses. Information derived was used to answer research questions that determined the relationships between the different quality benchmarks. The chi-square computation of all the objectives identified was subjected to test by SPSS version 15.0. The Pearson Chi-Square value for significance was determined between 0.00-0.05. Triangulation was finally employed to examine how the data collected from all the sources answered the research questions.

Findings and discussions

The findings were guided through seven measurable deliverables drawn from tables 1 and 2 on pages 6 and 15 respectively. The themes included:

1. Quality of teaching-learning and evaluation,
2. Organization of practical work as indicated in the course outline,
3. Students' evaluation of their Lecturers,
4. Supervision of the Lecturers by their Heads of Departments,
5. The use of all the available time assigned on the time table correctly,
6. The use of tutorials to augment teaching and learning in Science-based Faculties, and
7. Whether lecturers were happy with their class enrolment.

Quality of teaching, learning, measurement and evaluation

Table 1

Respondents' Opinion on Quality of Teaching Learning and Evaluation in the Science-based Departments at Gulu University

ITEMS	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree	% agreement
1. Students and Lecturers report to the University promptly at the start of the Semester	14.47	32.89	3.95	33.33	15.35	47.37
2. Teaching and Learning start promptly every semester	15.72	33.19	4.80	32.31	13.97	48.91
3. The University follows the Uganda NCHE (National Council for 4. Higher Education) quality standards/check lists to guide teaching and Learning	8.48	39.29	22.77	20.54	8.93	47.77
5. Management reports indicate that Lecturers avail students with course outlines in their departments	34.78	53.04	1.74	7.83	2.61	87.83
6. Whether ICT is integrated in teaching and learning	60	40	-	-	-	100
7. Reports on syllabus coverage in all programmes are Satisfactory	18.50	47.14	4.41	20.70	9.25	65.64
8. Management reports indicate that assessment feedbacks are sent timely to the students	15.86	38.77	2.64	24.23	18.50	54.63
9. Management reports indicate that the departments organize practical work for the Learners as stipulated in the course outline	6.64	21.68	4.87	31.42	35.40	28.32
10. Management reports indicate that attendance records for Lecturers and Students are Available	30.26	49.12	7.02	8.77	4.82	79.39
11. Management reports indicate that students get involve in evaluating their Lecturers	2.62	13.97	8.73	31.44	43.23	16.59
12. Management reports indicate that Heads of Departments carry-out regular observations of lectures	7.02	21.49	15.79	28.95	26.75	28.51
Average	20.89	38.69	7.67	23.95	17.88	50.49

Source: Primary Data

As clearly indicated in the statistical analysis on table 1 above, the report indicated the following: General drawback on quality standards; non observance of the semester schedules, late start of teaching and learning at the beginning of the semesters, non adherence to the National Council for Higher Education (NCHE) checklist to guide teaching and learning, poor management of the curriculum in handling practical disciplines, lack of evaluation of the lecturers by their students; and negligence by the Heads of Departments to carry-out regular observations of their lecturers.

The overall implication of the aforementioned drawbacks is that they impinged on the entire management of the curriculum thereby affecting the quality stance of the disciplines in question. Pointless to reiterate, these omissions undermined the core of the curriculum and contradicted Diana's (1994) conjecture that; "in higher education and in education generally, the quality of teaching and learning is paramount without which there is no legitimacy for any educational institution". In addition Sunal, W. D et al (2007) study reported that:

Traditional pedagogical approaches of Instructors in undergraduate introductory science courses do not work effectively with many of today's students...helping students understand ideas is a complex task. Doing it well takes a significant amount of instructors' knowledge and skills...science faculty have little, if any, professional training in teaching.

What this means is that, the professors at university level should be trained and imbued with more skills in the field of pedagogy, andragogy and synagogy, so that they become all-round and innovative and more especially in the management of teaching and learning, against an increasing students' numbers and reduced educational resources overall (massification).

Professor Bain. K. (2004) Director Centre for Teaching Excellence, New York University, had this to say: "The best teachers conceived of teaching as anything they might do to foster sustained and substantial changes in the way students think, act, or feel without doing major harm...one can't teach well by the numbers anymore than one can expect to become a great artist by painting in that fashion. Excellence in teaching requires deep thoughts and often profound and subtle changes in the way we think about the nature of both teaching and learning."

In the study, the Gulu University Management team indicated that only about 65.64 % agreed that syllabi coverage was satisfactory and 34.46 % neither dis-agreed nor were decided on the subject matter. These levels of disagreements or indecisions were critical in terms of academic achievement because it impacted directly on the learners' subject competence. In the department of Computer Science however, the Head of Department revealed that, an innovative approach of sending text messages through mobile phones to students and staff as reminders for prompt reporting was introduced and being enforced as remedial strategy to achieve curriculum demands.

Seeking the opinion of the Deans and Heads of Departments during their interviews, they disappointedly revealed that the use of Uganda NCHE quality checklist were not prominent in their faculties and departments. They however agreed that at times Senate drew their attention to the observance of the checklist and also directed the office of the Academic Registrar to make follow ups. They further revealed that even the pamphlets of the NCHE checklists were lacking

and unavailable at departmental levels. The summary from the Deans' responses revealed that the NCHE guidelines were dispatched to universities at policy level, however, their implementation needed to be enforced. The implication of that gap actually left the Deans, Heads of departments and the Lecturers uninformed about many of the quality checks which should have guided the management of teaching and learning, e.g; the facilities-student ratio, space specification to student ratio, student to lecturer ratio, etc. which eventually culminated into poor mitigation of massification at the various levels.

The forgone pronouncements were confirmed by the lecturers and students when they were asked during their focus group discussions. Both categories appeared totally ignorant about the NCHE quality assurance checklists. They revealed that apart from the course outlines given the students at the start of their courses, no other documents to guide teaching and learning were availed. This was a serious quality assurance drawback since both the lecturers and their learners were in a total blackout of what mandatory conditions they should have abided by in the teaching-learning environment as stipulated by the NCHE quality checks.

Organization of practical work as indicated in the course outline

On the report whether practical disciplines were given due attention as recommended in the various syllabi, most of the respondents dis-agreed that practical disciplines in the science-based faculties at Gulu University were organized as stipulated in the course outlines and given the desired attention. There was a 66.82% dis-agreement of all respondents. Meanwhile, 52.63%, 75.44 % and 73.25% were levels of disagreements expressed by the departments of Human Anatomy, Bio-system Engineering and Computer Science respectively. The major short comings quoted by most of the respondents cited the inadequacy of the necessary science equipment and facilities. The general outcry was on the high students' numbers and the lack of equipment and facilities. The equipment to student ratio was discovered high in all the departments studied e.g. in the Department of Human Anatomy, there were only 8 cadavers, 9 microscopes to serve 85 students, giving the equipment to student ratios of 1:10.6 and 1:9.4 respectively. See figure 1 on page 9.



Figure 1. A photograph of Microscopes in the micro-Biology Laboratory at Gulu

Figure 1 above shows the microscope settings in the microbiology laboratory. Besides, there were only two lecturers in the department of Human Anatomy. Opinion of all the students interviewed from this department indicated that inadequate learning facilities greatly infringed on the management of the practical teaching sessions because learners had all the time to crowd around the equipment or specimens and that made learning stressful and impaired efficient and effective interaction with the learning aid.

A Chi-square test was run, to establish the relationship between required ratios and quality of teaching, learning and evaluation. The Pearson Chi-Square value was found to be 35.827 with 20 degrees of freedom and an assumption significance of 0.016, which was less than 0.05. That meant, the hypothesis that there was no relationship between required ratios and quality of teaching, learning and evaluation was rejected. The required ratios therefore had a significant influence on the quality of teaching, learning and evaluation at 5% level of significance. This result strengthened the position and tallied with the opinion expressed by the students from the Faculty of Medicine on the negative impact created by lack of teaching-learning facilities on the students. What that result postulated was that to manage incidences of massification, the academic units must balance students' enrolment with the teaching learning resources. See table 2 on page 10.

Table 2

Relationship between Required Ratios and the Quality of Teaching Learning and Evaluation in the Science-based Departments at Gulu University

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	35.827 ^a	20	.016
Likelihood Ratio	37.714	20	.010
Linear-by-Linear Association	17.968	1	.000
N of Valid Cases	231		

a. 19 cells (63.3%) have expected count less than 5. The minimum expected count is .02.

In the department of Computer Science where most of the students went for their computer hands-on experiences, the computer to students' ratio was worst with hardly 20 computers in working conditions, with the rest broken down, but serving over 500 students. Here the situation was rather unique because it was compounded with students from other faculties also rushing into the department to have their hands-on experiences. In the department of Bio-systems engineering, most of the equipment was lacking so the students had to go to other institutions for their engineering practical. Again this was considered time wasting, expensive, a sign of improper planning for the educational resources and at times risky because of the long journeys the students had to make to Arapai Agricultural College, Ngetta Farm Institute in Lira, Comboni Vocational school or Makerere University farm at Kabanyolo.

However, on a rather contradictory note, when a chi-square test was run, to establish the relationship between sufficiency and quality of educational facilities and quality of teaching learning and evaluation, the Pearson Chi-Square value was found to be 10.118 with 12 degrees of freedom and an assumption significance of 0.606 which was more than 0.05. This meant the hypothesis that there was no significant relationship between the sufficiency and quality of facilities on the quality of teaching, learning and evaluation is accepted. See table 3 on page 11.

Table 3

Relationship between Sufficiency of Quality of Educational Facilities and Quality of Teaching, Learning and Evaluation in the Science-based Departments at Gulu University

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.118 ^a	12	.606
Likelihood Ratio	12.982	12	.370
Linear-by-Linear Association	.262	1	.609
N of Valid Cases	231		

a. 14 cells (70.0%) have expected count less than 5. The Minimum expected count is .01.

The sufficiency and quality of facilities therefore had no significant influence on the quality of teaching, learning and evaluation at 6% level of significance. This rejected the respondents' position that inadequacy of facilities had a direct influence on the quality of teaching, learning and evaluation. The clear explanation to this conclusion was justified by the fact that; innovations, creativity, discoveries, research, replication, inquisitiveness to learn and the application of various methods for content delivery by the lecturers and the general level of inquisitiveness and ingenuity by the learners normally determined the teaching, learning and evaluation direction.

According to CDT Link (2001) whose emphasis was on the teaching of physics, noted that; a new approach to teaching practical physics was proposed whereby the new method centred on a 45-minute discussion held prior to each practical session during which students are encouraged to explore various ideas and make use of common place knowledge towards planning for a proposed experiment. It further postulated that the traditional physics practical often failed to motivate and challenge students to learn science by discovery. On the same note, it was discovered that teaching chemistry by guided inquiry was simple! It gave more time to prepare labs and more time to help students. "There will be more time to prepare other lessons and demonstrations. And none of this extra time will be at the expense of your students ...your students will learn more effectively and become more successful.

(http://www.chemistryinquiry.com/about_chemistry_guided_inquiry.htm).

The Uganda VCPU (2006) noted with regrets that the state of facilities in all our public universities are either broken down owing to lack of repairs and maintenance, short in supply, out-dated or the laboratories are too small to accommodate the ever increasing numbers. It further noted that the increase in students' numbers had not been matched by a corresponding increase in physical and educational facilities or human and financial resources...to the detriment of quality

education provision. The Committee was emphatic to observe that for any modern university to deliver quality education, it must have adequate educational resources including books, journals, scholastic materials, computers, including internet access, lab/workshop, and opportunities for field work and industrial attachments. To address the shortage of facilities especially in the department of Computer Science, learners are being encouraged to acquire their own laptops, adopt on-line studies and possibly possess kindle E-book readers.

Integration of ICT to support teaching and learning

Meanwhile there was an overwhelming agreement on the integration of ICT to support teaching and learning. This included the use of the internet, mobile phones, desk tops and lap tops computers, tablets and iPods. These gadgets were used for information delivery both by lecturers and students, surfing, communicating course work assignments, etc. In the department of Computer Science the Head of Department confirmed that the department uses ICT platforms for various purposes including sending text and email messages to students and staff as reminders for prompt reporting; apart from using it for teaching and learning and other academic management and engagements. The serious problems noted however were twofold:

- a) the inadequate numbers of computers and the low internet bandwidth from the institutional point of view, and
- b) the incapacity of the learners to own their own gadgets- laptops, iPods, tablets, kindle E-book readers which eventually reduces students' capacity on the usage of ICT. The Dean therefore opined that learners should acquire their own laptops, possess better capacity smart phones, acquire kindle E-book readers and adopt to on-line study programmes.

When a chi-square test was run, to establish the relationship between required ratios and quality of teaching, learning and evaluation, the Pearson Chi-Square value was found to be 35.827 with 20 degrees of freedom and an assumption significance of 0.016, which was less than 0.05. That meant, the hypothesis that there was no relationship between required ratios and quality of teaching, learning and evaluation was rejected. The required ratios therefore had a significant influence on the quality of teaching, learning and evaluation at 5% level of significance. This result strengthened the position and tallied with the opinion expressed by students from the Faculty of Medicine on the negative impact created by lack of teaching-learning facilities on the students. What that result hypothesized was that to manage incidences of massification, the academic units must balance students' enrolment with the teaching learning resources.

Students' evaluation of their Lecturers

Turning to the question of evaluation, the overall responses from all sections; the questionnaires, interviews and focus group discussions reveal that neither the students nor the Heads of Departments (HoDs) carried out evaluation at their respective levels. Question 10 on response to management report presented in table 1 page 5, with respect to evaluation by HoDs on lecturers, show that only 28.51% of Management agreed that HoDs carried out evaluation of their lecturers against 55.7% level of agreement and 15.70% level of indecision.

The students' responses in their focus groups on this caption were very disturbing. Most of them observed that they did not have any avenue for objectively critiquing their lecturers. Their greatest complaints were targeted towards lecturers cutting lectures or at times unprepared to deliver

lectures. With respect to the department of computer science, the students reported that sometimes there was even collaboration between the class representative and the lecturers to have the latter's attendance list signed even if the lectures were not delivered. In other instances lecturers sent notes to be dictated to the class, but follow-up explanations of these notes sent to students were not given. The foregoing contention tallied with the poor percentage response rate of only (33.91 %) of respondents who agreed that lecturers used the available time assigned on the time table correctly. The students therefore strongly suggested that end of semester evaluation on each course should be done so that they are able to give their opinion on the entire curriculum management- the subject content presented, the general teaching-learning situation, availability of educational facilities, coverage done, as well as on the performances of their lecturers.

The Romanian Agency for Quality Assurance in Higher Education (ARACIS), set up in 2006, postulated that the quality of education provided to students relies on the quality of academic staff as a result of the analysis of three components: students' assessment, peer assessment and institutional assessment of the teaching staff. It is therefore crucial for institutions to attract, recruit, develop and retain quality academic staff. With teaching assuming an increasingly important role, Mohamedbhai (2008) illuminates that several of the Universities worldwide have realized that it was important to train staff in pedagogical and other University skills, especially as they have to deal with large cohorts of students. In Kenyatta University for example, in 2004, a centre for University pedagogy was created to train teachers how to deal with large groups of students.

Supervision of the Lecturers by their Heads of Departments:

Turning to whether the Heads of Departments supervised their lecturers, 55.70% of all respondents expressed disagreement. Similarly, 69.34%, 66.66% and 67.42% were levels of disagreements expressed by the three departments of Human Anatomy, Bio-system Engineering and Computer Science in the same concern respectively. The major reason advanced by the heads of departments for that negligent lingered around the pressure created due to the insufficiency of the required staff in the department which thus culminated into heavy schedules mounted on them. This study revealed that the number of academic staff in science-based faculties at Gulu University was inadequate to marshal the expected tasks, in addition, there were very few staff members at Masters and PhD levels, the majority of the lecturers in Gulu University science-based faculties were Teaching Assistants (TA).

Corroborating the foregoing to the Uganda NCHE (2006) underpinning that the quality of academic staff is central to the quality of any university education, it was easy to appreciate the fact that the level and quality of academic staff in the science-based faculties still remains insufficient and inadequate. The Uganda University and Other Tertiary Institution Act, Section 119 stipulates that; "No University or Tertiary Institutions shall employ a Lecturer, Instructor or other persons recruited for the purpose of teaching or giving instructions to students whose qualifications do not conform to the standards set by the National Council regulations".

Notably the percentage agreement levels here were extremely low: Human Anatomy (29.34%), Bio-system Engineering (33.34%) and Computer Science (32.58%) an implication that quality standards are at stake and should be re-vamped. When the Heads of departments were asked

during their interview sessions, they indeed agreed that they don't carry-out evaluation of their lecturers because they were convinced that they are doing a good job. They insinuate that the number of lecturers on the ground is significantly low, yet they are able to fairly manage the increasing numbers of students.

Pointless to accentuate, what can be drawn from these responses, pointed to the fact that there was complacency and over assumption by the Heads of Departments of their roles and responsibilities. Secondly, those responses pre-supposed that some Heads of departments instead of viewing evaluation of lecturers by students as a holistic exercise to include how the programmes' expectations and the course outlines were being unfolded in the departments, what educational facilities and resources needed restoration, what class enrolment was being experienced in the department, had simply narrowed their supervision to seeing staff report on duty. In table 4 on page 15, attention was drawn to questions 8, 11 and 12 which addressed; the use of time assigned on the timetable correctly, the use of tutorials to augment teaching and learning and whether lecturers were happy with the class enrolments.

Table 4

Respondents' Opinion on Lecturers' Performances in the Science-based Departments at Gulu University

ITEMS	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree	% agreement
1. Clearly explain the objectives of the Course and have good sense of Instructions	17.70	56.64	8.85	10.62	6.19	74.34
2. Have very good grasp of the Subject matter	11.06	65.04	9.73	10.18	3.98	76.11
3. Are familiar with inquiry methods of instruction	9.69	63.44	11.01	12.78	3.08	73.13
4. Are sensitive to individual differences and encourage personal opinion	13.10	56.77	9.61	14.41	6.11	69.87
5. Provide immediate and meaningful feedback to students' efforts	13.60	48.25	13.16	20.18	4.82	61.84
6. Are effective and efficient instructors	13.16	48.68	16.23	17.98	3.95	61.84
7. Complete assigned task in time (Course Units)	12.66	44.54	8.30	22.27	12.23	57.21
8. Use all the available time assigned on the time table correctly	9.13	24.78	8.26	36.96	20.87	33.91
9. Freely discuss with students during lectures	33.04	54.35	6.09	5.22	1.30	87.39
10. Mark students' course work and test in time	15.65	42.17	6.96	25.22	10.00	57.83
11. Organize tutorial classes	2.61	38.26	12.17	28.26	18.70	40.87
12. Are happy with class Enrolment	8.26	41.30	33.04	13.48	3.91	49.57
Average	13.31	48.69	11.95	18.13	7.93	61.99

Source: Primary Data

At the University Eduardo Mondale all Mozambican lecturers are required to undergo training in teaching skills. The training was introduced in 1989 through a long-term collaborative project with a Dutch University, financed by the Dutch government. Apart from teaching methods, which is the 'core' course and includes techniques of handling large classes, other courses offered by that centre are: students' assessment, conducting laboratory sessions, curriculum development and materials development. Attending at least one of these courses, essentially the 'Teaching Methods' one, has been a compulsory prerequisite for the promotion of full-time Junior Lecturers (Mohamedbhai, 2008)

Subscribing to the above clarification by Mohamedbhai (2008) the researcher strongly advises managers of universities in Uganda and especially those of Gulu University to embrace good

practices adopted by other universities in the region to improve content delivery in the face of massification so that the lecturers and the learners may enjoy their class interactions and especially during the teaching of science practical. Whereas the above postulations may be true, the researcher is opined to suggest that in a young growing University like Gulu, with an infant faculty history and lean on academics in all aspects, the University must emphasize progressive model-ship, academic mentorship and pedagogical support training for the young academics as well as cautious growth and development so that the achievement of the University's core functions unfolds to the satisfaction of desired quality standards and expectations; and the challenges posed by massification in the science-based faculties get correctly managed.

Different countries and universities in the world have set up different terms and conditions to manage their academics and other staff:

In Denmark, universities are free to determine the number of available positions for academic staff, but they must, however, respect a maximum limit for the number of Professors, which is established by the Ministry of Finance. The Ministry of Science, Technology and Innovations then distributes the chairs among the universities. Overall, the recruitment procedures are established by Ministerial order, with universities being responsible for the recruitment procedure as such. In Estonia and Latvia, Institutions are directly responsible for the appointment of staff (choice of the number and distribution of categories of staff among the different departments), whereas the official regulations state the general and specific recruitment criteria (profile, degree(s) required, previous professional experience, etc.), for each category of teaching staff. In Spain, universities decide on the number of available positions (teaching and others), whereas the selection criteria and conditions for access to permanent positions are based on the official regulations in force at national level. In Malta, according to the Law on higher education, the University and the *Malta College of Arts, Science and Technology* (MCAST) is responsible for determining the number of posts required. MCAST has set its own recruitment criteria for different categories of staff. However, with regards to the composition, academic staff in the University sector is characterized by considerable gender differences (Jensen, 1997; Stähle, 1998). In Science and Engineering the proportion of female staff is predictably small, but in areas such as the Humanities, Law and Medical Science, where the majority of students are now women, men continue to dominate the teaching staff, especially at the tenured levels (UNESCO, 2004).

The use of all available time assigned on the time table correctly

The students complained during their focus group discussions that more often than not, the lecturers did not turn up for the tutorial sessions. The position of the students featured very clearly with a dis-agreement rate of (57.83%) on item 8 in the questionnaire respond on table 5 annexure 5, which sought to find out whether lecturers use all the available time assigned on the timetable correctly. The students further observed that they would prefer to use such moments for their own private studies or group discussions or hands-on experiences in the computer laboratories or for internet surfing in the library or for writing their coursework. The lecturers on the other hand didn't challenge the students' position during their interviews, but reasoned that the pressure mounted on them because of the demand on the timetable sometimes made them

assign work to their learners instead of being in class physically. These observations from the students and their lecturers are quite indicative that the teaching-learning process has some management challenges to be fixed.

The use of tutorials to augment teaching and learning in Science-based Faculties:

The use of tutorials to augment teaching and learning in science-based faculties at Gulu University was 49.57% agreement against 46.96% dis-agreement. The use of tutorials to augment teaching and learning was noted to be poor and rare in the Science-based departments at Gulu University. The Lecturers observed that the Learners' response to tutorial engagements was very poor and therefore felt that the time allocated for tutorials on the time table should have been used for other productive academic activities in the departments. Secondly, they argued that, because of inadequate classroom space due to the many programmes mounted, most classrooms were engaged for normal lectures or practical, thus availing difficulties in finding no space for the tutorial sessions. This observation should however, not compromise the importance of tutorials in the teaching-learning process.

The Lecturers during their interview session vied that their number was thin on the ground compared to the ever increasing enrolment and number of courses they are made to teach to the extent that they found themselves overworked and left with little time for their personal researches and other academic pursuits, and do sometimes sacrifice time for tutorial sessions in order to satisfy those other obligations.

Yandila (1995), in furthering this point, observed that academic quality was deteriorating in African universities and that staff recruitment was difficult particularly at senior levels. He thus recommended that the African Universities should be very creative in attracting staff for without them; they cannot play their role of human resource development. To support the foregone argument, it was found that out of the 23 Gulu University lecturers who participated in the study, only one of them was female and just at the rank of a Teaching Assistant. It was also realized that the number of staff with Masters and PhDs were still few. This is a reality that the science-based faculties and indeed the entire university must try to overcome and address by supporting female based scholarships and affirmative recruitment drives as well as send more academics to attain higher degrees. The researcher further contended that drawing from these various university cultures around the globe, the science-based faculties could adopt a workable strategy of building up their staffing capacity at Gulu University more especially to target universities' challenge of the 21st Century, of which control and management of massification feature amongst the priorities.

Whether lecturers were happy with their class enrolment:

Addressing the state of sufficiency or insufficiency of educational resources in the science based faculties at Gulu University; respondents' opinions were sought through eight parameters which included: library reading space, library texts, library chairs, classroom space, classroom chairs, laboratory space, laboratory chemicals and laboratory equipment. These parameters were identified because they form the core facilities required in a teaching-learning environment. To draw the expected data therefore, respondents' opinions were tapped using the following cues:

Adequate to mean (Readily Available), Satisfactory to mean (Can be accessed), and Inadequate to mean (Difficult to access).

The analysis of questionnaire results from all the 231 respondents who participated in the study revealed that the science-based departments were in short supply of the required educational facilities. The average score on all the eight parameters under the key cues were as follows: adequate 13.98, satisfactory 25.47 and Inadequate 60.54 respectively. Results from the in-depth interviews with key informants; Deans, Heads of departments and Corporate Managers as well as from focus group discussions with students and lecturers all castigated the severe inadequacy of educational facilities the University is experiencing. They contended that the ever increasing numbers of students without commensurate increase in physical facilities is the major cause of the poor state of affairs. The areas they considered hard hit include: lecture space, chairs, computers and accessories, equipment and specimen in the laboratories, library texts and internet connectivity. These findings corroborate well with the position advanced by (Edqual, 2005) that in sub-Saharan Africa, many governments were still unable or unwilling to make appropriate resource commitment at higher education institutions that was proportionate to student numbers. As a result, resources that were made available to support rapid growth in these institutions, including equipment, buildings, staffing and staff time and benefits, were not adequate to maintain the quality of programmes and students' learning experiences. This was severely undermining the commitment demanded of higher education institutions to produce highly skilled, mobile, and globally competitive workforce that was able to adjust to a rapidly globalising world economy. To address the shortage of facilities especially in the department of Computer Science, at Gulu University, learners were encouraged to acquire their own laptops, adopt on-line studies and possibly possess kindle E-book readers.

According to Kulazikulabe (1978), education institutions in Uganda sometimes lacked even the minimum of required educational materials of all types. Where they existed, they were insufficient or even sub-standard. Shaeffer (1992), on the other hand advanced that quality in education is explained in terms of inputs, outputs and processes. Inputs including materials: class building, desk, chalkboard, textbooks, and laboratory equipment as well as teachers and students whose quality were often measured in terms of qualification of teachers, text books relevance and students' intellectual and nutritional status. The VCPU (2006) upholds that Key components to teaching and learning are quality of the educational resources and academic staff.

Heinemann, Jamison and Montenegro (1984) while discussing textbooks availability and other factors in students' learning in south-east Asia found that, such facilities impact on students' achievement. In their study, they found that provision of better textbooks and increase of ratio of textbooks to pupil could have significant improvement to students' achievement. These studies indicated that learning and reading materials were extremely important in knowledge dissemination. To augment the foregone postulation, the Education Policy Review Commission [EPRC] (1989) and the Ministry of Finance Planning and Economic Development [MFPED] (1994) identified instructional materials particularly textbooks as the most cost effective way to improve quality of education because they provide learners with information on various disciplines and thus enabled them to acquire new knowledge that was put into use in solving educational problems.

In Uganda, the NCHE developed general checklist of quality and capacity indicators for assessment of Universities and Programmes (NCHE, 2011 pg 32, 33). In this framework, parameters for assessment have been identified under five descriptive headings: **Ideal; Good; Acceptable; Can be improved** and **Unacceptable**. According to the NCHE (2005), the lecturer/student ratios are among the indicators of quality education in any modern university. In the developed countries, the Lecturer/Student ratios in higher education institutions range from 1:12 in Japan to 1:18 in the United Kingdom (OECD, 2003). In Uganda, the NCHE set the general Lecturer/Student ratio at 1:15 (Statutory Instrument 80 of NCHE, 2005). Important to note was that Mbarara University of Science and Technology (MUST) and Gulu University had the best Lecturer/Student ratios at 1:8 and 1:12 respectively (VCPU, 2006), which in the terminology of the Uganda NCHE is rated good and arguably, would imply that quality standards should be higher in MUST and in Gulu other than in any of the Public Universities, taking all factors constant.

Notwithstanding the above conjecture by the Uganda NCHE, it is worthwhile stating that this ratio debate must not stand in isolation of other factors; classroom, laboratory and library space specification as well as laboratory equipment and library text and other educational resources. Ratios for various subject discipline areas in practice at international level were indicated as here stated: Human and Veterinary Medicine 1:8; Science/Technology 1:10; Arts/Humanities 1:15. The ISURA (2012) revealed that in one of the systems practiced in the United States of America (USA), the ratio of cadaver to students' stands at 1:2 maximum 1:3. Furthermore the University of Medicine and Health Sciences UMHS, Saint Kitts and Nevis (2012), puts the ratio at 1:5. At Gulu University this was relatively high; standing at 1:12. The Uganda NCHE has sometimes used students' enrolment versus the number of books at public universities in Uganda to explain deviation from the expected. The most recent statistics was developed using the 2005/06 enrolment figures, where Gulu University book/student ratio was quoted at 1:3 (NCHE, 2006). However, with the ever increasing numbers of students at enrolment and the continued ceiling on staff recruitment, coupled with inadequate facilities, the researcher propounds that lecturers should adopt new skills of conveniently reaching their Learners, these amongst others include: Splitting the class into small learning and study units, setting clear and specific teaching- learning objectives, continuous assignment of study tasks followed by concurrent evaluation, continuous assessment of learnt tasks, and above all being Lecturer who love their work and the achievement of their learners.

Talking about required ratio the researcher ended discussion on research Q3. Oxford Advanced Learner's Dictionary defines ratio as the relationship between two groups of people or things that is represented by two numbers showing how much larger one group is than the other. In a teaching-learning environment, the ratio of learners to teacher is paramount and crucial. According to UN (1973) report, it was accentuated that teachers give maximum attention to the Learners when the pupils-teacher ratio is low. When teacher pay little attention to the pupils, the level of performance is greatly affected. Thus, as the pupils' enrolment increases, there is need to increase teachers' recruitment as well. UNESCO (2000) recommended that Students' population in a single classroom should not exceed 1:30, or at most 1:35 in order to foster provision of

quality teaching and learning. However, due to increased enrolment at all levels of education, this numbers were too few to call.

Whereas the discourse advanced by UNESCO (2000) in the foregone paragraph, is an earlier research position, it was important to draw caution that enrolment in the science-based disciplines at university level must not just be guided by such ratio principles or justification, but rather implemented based on adequacy of educational resources and facilities. Onwo (1998) contended that the class size was a big factor in determining the attainment of educational goals and objectives. While Edge (1980) in his study reported that in large classes, the provision of an opportunity for discussion or any kind of oral input to the written work was difficult. Similarly, Powell (1969) observed that, large numbers of students in a class allow almost no opportunity for genuine exchange or arguments and opinions.

CONCLUSION

Though effective teaching and learning remains critical in knowledge dissemination, it is not absolutely true that it was a solution to massification in science-based department in Gulu University. It is here argued that teaching and learning must work in combination of other key factors which include; adequate class building, desks, chalkboards, library resources, laboratory equipment as well as trained calibre academics, the correct use of text and home work/assignment, the encouragement of child-centred learning, the absolute amount of time spent on tasks and so on and so forth that positive results can be attained.

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