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IMPROVING MANAGEMENT OF TEACHING SPACES IN HIGHER INSTITUTIONS : THE WINNEBA MODEL

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ABSTRACT

As enrolments keep expanding in tertiary institutions teaching spaces become a scarce commodity. This is often so because expansion in teaching and laboratory spaces are not keeping pace with expansion in student enrolments. Efficiency in the management of available teaching spaces becomes the watch word for institutions seeking to expand student intake.

The University College of Education of Winneba which first grew out of three diploma awarding institutions had to accommodate a larger student number in its apparently overused teaching spaces in the first semester of 1992 / 93 session.

The use made of teaching spaces hitherto, was assessed ex post facto. A central timetable, in which all teaching spaces on the three campuses were pooled for shared use by all students was then launched. The existing teaching spaces were not only sufficient but had rooms to spare for new programme of distant education and for residential accommodation. The use of the remaining rooms restricted to teaching (and which could accommodate more classes) were then re-assessed in March 1993, and the utilization rate increased from 25.4 % to 38.9 %. The installation of the central timetable on the campuses unlocked the golden gate for enrolment expansion at Winneba.

Introduction

This is a period of declining economic fortunes in the different regions of the world in general and in Africa in particular. Most African governments are consequently facing financial crisis in the management of tertiary education. The solution to the problem of tertiary education financing appears to lie in :

- * Finding alternative modes of financing tertiary education.
- * Promoting efficiency and cost effectiveness in the management of educational resources.

This is the report of the research study conducted into a way of promoting efficiency and minimizing cost of tertiary education in Africa. The study was made possible by the appointment of the author by the Commonwealth Secretariat as a consultant on space management to the ministry of education, Ghana, for the country's education reform programme.

For lack of statistical data planning departments of most African universities manifest little or no finesse in dealing

with the problem of how to manage teaching spaces. The Association of African Universities conducted a study in 1991 and enumerated the obstacles to using space efficiently. In African universities rooms are allocated to faculties and departments sometimes on a permanent basis, and regardless of disparities and misfits in room sizes and class sizes faculties schedule classes within their confines for their rooms. Data are not kept on space utilization, and the use made of teaching spaces is hardly ever assessed. Sanyal (1994, p.11) concluded that planning of space utilization in the region seems to require some improvement.

Prior to the establishment of the new University College of Education of Winneba in Ghana, there were three diploma awarding institutions in the town. These were : The Advanced Teacher Training College, (ATTC), the National Academy of Music (NAM) and the Specialist Training College (STC). The teaching rooms on the campuses of ATTC and NAM, which operated departmentalized time tables were perceived to be over utilized as they were often congested and overcrowded (Owolabi, 1993 a). A student had to come early into a room to get a seat. Expansion in enrolment had to be kept in check and the Ghana Education Service embarked on the building of a new science block at ATTC and a new campus for NAM. The building projects progressed very slowly for insufficiency of funds. Then the three institutions were suddenly

upgraded into a university college status and the intervention design on better management of teaching spaces had to be introduced. In the main it consists of a simple way of generating and storing statistical data on time table inputs (number of courses, class sizes, number of work stations in each room, teaching time, etc.) and devices a management technique for optimizing the utilization of teaching spaces.

The Mechanics of Assessing Space Utilization

Teaching spaces in educational institutions are being expanded everywhere, every year. The world devoted about \$ 20 billion to expand teaching spaces in schools in 1970 (Hallak, 1977, p. 12). The amount has increased enormously in recent years and it is still on the increase. But resources can be unnecessarily committed to putting up more buildings in tertiary institutions when the existing ones have not been put into maximum use. If we were to invest more in building than there is the need to produce a given output the likely waste would imply that we were providing less satisfaction for a given amount of cedis invested in tertiary education. To know if there is any need for additional building and to know how serious the need may be the utilization of the existing buildings both in space and in time should always be diagnosed. The diagnosis is also necessary for the assessment and priority ranking of needs in the various institutions under the

management of an agency. The efficiency of school plant utilization depends largely upon the degree to which the various rooms can be used during all the hours of the day (Stoops, Rafferty and Johnson, 1995, p. 222).

There are two dimensions to teaching space utilization. The first is the frequency of use factor. Here, the percentage of time for which a teaching space is put into use is considered. This is the time utilization of rooms. The goal of good resource management is to maximize the efficiency of the use made of the resources provided. Over time buildings get damaged not only because they are put into use by human beings but also because cracks are created by expansion and contraction during temperature changes; rusts and decay are brought in by corrosion and oxidation; wall bases are dug by erosion, etc. Agents of weathering are more active in humid areas where lizards, spiders, rats and birds take possession of unused rooms. This is to say that buildings are used up by time as well as by man. This is a paradox of space resource utilization. Because unused buildings depreciate relatively fast in hot climatic zones the proportion of working hours for which a room is put into use in Africa becomes more important for efficiency considerations. The institution that has more programmes and/or more classes are likely to have a greater frequency of use of their rooms (Owolabi, 1993 b).

The second dimension to room utilization relates to mapping of groups and rooms. This is the dimension that considers the proportion of room space put into use. The occupancy factor takes into consideration the number of students using a teaching space in relation to the number of work stations in the teaching space. A room designed to accommodate 40 students but used by 4 will have a poor occupancy rate. The facilities in the room (electric light, air conditioner, projector, chalkboard equipments and any other audio-visual) vary very slightly, if at all, with the size of the audience. The more the number of students in a room the greater the space utilization will be (Owolabi, 1993 b). There is however a turning point when a class size much larger than the capacity of a room space, as in period 2 in room LGL 18 below, will tend to accelerate the rate of equipment deterioration.

Statistical means have been devised to quantify time and space utilization of teaching spaces. Time utilization of teaching spaces in tertiary institutions is measured in hours. In most African universities the spaces are available for 12 hours in a day. If a room is used for 9 hours a day, as for LGL 18 below (see p. 39), the time utilization rate is

$$\frac{9}{12} \times \frac{1}{100} = 75\%$$

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space. If 41 students are in a room with latent capacity for accomodating 90 students, the space utilization rate (occupancy rate) is

$$\frac{41}{90} \times \frac{100}{1} = 45.6\%$$

It is possible to synthesize the two parameters and come up with a global utilization rate that puts time and space into consideration. The global utilization of college rooms is measured in student-hours. If 41 students use a room for 9 hours in a day, we have 41 x 9 student-hours of use. But the room can seat 90 students for 12 hours, providing 90 x 12 student-hours. If we compare the real utilization with the potential utilization and express it in percentage we will have

$$\frac{41}{90} \times \frac{9}{12} \times \frac{100}{1} = 34.2\%$$

But the size of classes occupying teaching spaces in tertiary institutions vary from hour to hour, as we have for LGL 18 below. Instead of multiplying 9 hours of use by a constant size of 41 students, we add up the number of students in all the 9 classes (giving 417 student-hours) and compare the sum with the theoretically possible number of student-hours. That is 417 compared to 90 x 12, for room LGL 18. Global utilization rate of LGL 18 would therefore be

$$\frac{417}{1080} \times \frac{100}{1} = 38.6\%$$

We can compute the utilization rate of all the rooms in a faculty or in the whole institution for a day by adding up all the student numbers in each teaching space for all the hours of the day and all the days of the week and base the grand total on the grand total of theoretical student-hours for the whole institution and convert to percentage. For the Faculty of Arts rooms below we have 492 student-hours (by adding up all the numbers in the cells) for Monday. But 158 x 12 student-hours of use is theretically possible. Therefore utilization rate of all the rooms in the Faculty of Arts for Monday =

$$\frac{492}{1896} \times \frac{1}{100} = 26\%$$

A computerised data system showing the numbers in class per each of the course taught in each room each period in the week facilitates the storing of data for assessing utilization of teaching spaces. Such assessment should be carried out before new teaching spaces are constructed.

Table 1
Space Utilization in the University of Ghana 1993

UNIVERSITY OF GHANA, SPACE UTILIZATION SYSTEM, 1992/93

<i>Name of Faculty Arts</i>	<i>Day of Week Monday</i>	<i>Student-Hours 492</i>	<i>Possible St. Hours 1896</i>	<i>Uti - Rate 26.00%</i>
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PERIODS

Room Code	1	2	3	4	5	6	7	8	9	10	11	12	RM -Size
LGL 18	41	131	62	13		8	50	44	44			24	90
LGSEM		7						14	16				20
SRR8									5				6
SRR 9		2											6
SRR11				12									6
CCLR		11	1	7									30
TOTAL	41	151	63	32	0	8	50	63	60	0	0	42	158

Conceptual Model for Central Timetabling

Timetabling is a decision support task that assists in no small measure, the process of managing teaching spaces in tertiary institutions to achieve educational objectives. The timetable is the list which makes a conspicuous display of time and places for course works and helps to organize institutional activities in a manner that ensures economy in the use of time and space. The author's approach to the task of central timetabling was based on principle of efficiency in the utilization of scarce resources. Efficiency is the optimal relation between inputs and outputs. An activity is being performed efficiently if a given quantity of output is obtained with minimum inputs or if a given quantity of inputs is able to yield maximum outputs. The inputs of the timetable sub-system are transformed into outputs with a view to obtaining as much teaching as possible and at minimum cost. For example, each of the ten former departments at Winneba was offering education as a course. The education classes used to occupy ten rooms at ten different periods with ten teachers. When the central timetable was installed the ten classes were combined and taught in two large lecture theaters (Assembly halls). There was savings in the use of space and time.

There are two broad groups of tangible inputs into the timetable sub-system : Teaching space (classes) and teaching time (teachers). (See the side boxes in figure 1 below). The other inputs - semester courses, requirements and requests, class sizes, operating hours, distance between rooms, et cet-era (see boxes above and below in figure 1) are merely symbolic. But these symbolic inputs greatly influence the allocation of time and space on the timetable. Utilization of teaching spaces and teachers' time are harmonized in the schedule for course work. Efficiency exists in a continuum, ranging from low to high. Efficiency of teaching time and teaching space range from low to high (see figure 1). There is a direct relationship between the efficiency of the timetable and the efficiency in the use of teaching space and teaching time. Where the timetables are of low quality (departmentalized, unco-ordinated and with several mismatches in room sizes and class sizes) the utilization rates of space and time will be low. The converse is also true. There is however an inverse relationship between efficiency of the timetable and unit cost of education. Where a good timetable leads to efficiency in the use of teaching resources the unit cost of education will tend to fall. Thus, good timetabling can, in the long run increase the efficiency in the use of teaching spaces and bring down the unit cost of education in tertiary institutions.

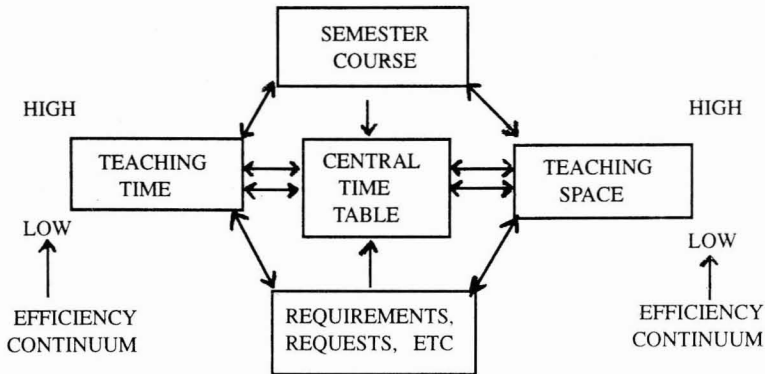


Figure 1 Conceptual Model for Central Timetabling

Source Owolabi S. O. (1993 a), *Utilization of Teaching Spaces and Teaching Time at UCEW, Report No. 1*, Accra : Ministry of Education

Method

The study is anchored on the hypothesis that shared use of teaching spaces can lead to a greater economy in the financial management of the University College of Education of Winneba. An assessment of teaching space utilization was first carried out to determine whether there was any need for additional building spaces for the new university college, and to provide a bench mark against which to measure achievements in any intervention design. The global utilization rate of the teaching spaces on the three campuses was 25.4%. It became clear that there was

no need for additional teaching spaces as at the time. What was required was the renovation of the old buildings with many cracks and leaking roofs.

Then all the teaching spaces were centrally pooled and coded. The campuses were renamed by the researcher and a new central timetable that would accommodate a greater number of programmes and of students, and use the teaching spaces more efficiently was designed and installed. Using a time tabling software (Gruber and Peters gp-Untis) when computers were made available

later, the timetabling processes were much facilitated by computerization.

Results

The researcher did not have to make use of all the existing teaching spaces for a centralized timetable. Some rooms were converted to other uses - the badly needed residential accommodation and a programme of distant education. Two other departments were brought in.

Despite the reduced teaching spaces and increased number of departments the central time table accommodated all lecture schedules without a single clash. The student number rose significantly and the utilization rate of teaching spaces increased except for the Art studios (student intakes were reduced in this dept. by government's policy). There was room for further expansion of programmes and student enrollment. Residential accommodation was then the only limiting factor.

Table 2
Space Utilization before and after the introduction of central timetable at UCEW

	CONTROLLED STAGE	EXPERIMENTAL STAGE
Number of Work stations	1,584	1,381
Total Student Enrolment	1,300	1,889
Total Number of Teachers	129	113
Total Number of Depts	10	12
Hours of classroom use/day	12	12
Global Utilization Rates :		
of classrooms	27.5%	40.0%
of Science Laboratories	22.5%	43.3%
of Home Science Workshops	27.4%	33.0%
of Art Studios	8.8%	8.0%
Utilization rate of all spaces	25.4%	38.9%

Sources : Culled from : Owolabi S. O. (1993a) *Utilization of Teaching Spaces and Teaching Time at UCEW, Report No. 1*. Accra Ministry of Education,

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Discussions and Conclusion

Utilization rates of space were low at the controlled stage. The space facilities were then pooled for shared use and a central timetable was installed. Utilization rates improved significantly. By industrial standards utilization of teaching spaces are grossly inadequate. As an example, a fully developed factory will use its plant 24 hours a day 6 days a week and in 12 months of the year. (Stoops E. et al 1975). The use of teaching spaces in tertiary institutions cannot go up anywhere near this potential for obvious reasons :

Specialized rooms have to be prepared for the incoming classes. Laboratories, workshops and studios have to be re-set for new classes. The size of the different classes using a teaching space vary. Both teachers and students need some interlude of rest in the middle of prolonged academic work. The "California model" of teaching space utilization stipulates that a university teaching space can be engaged four-fifths of the working day, and two-thirds of the

work stations could be occupied on the average. This would give a global utilization rate of 53.3%. One can conclude from this model that campus teaching spaces with utilization rate of less than 50% are underutilized. The goal should be to get near the 50% utilization rate before considering extension of classrooms. This does not however preclude the need to construct a few large lecture theaters for very large classes to save teaching time costs.

Officers in charge of space utilization need to provide input data for central timetabling and provide periodic reports on :

- Condition of teaching space facilities
- social norms for teaching spaces
- number of work stations in each teaching space
- rate of teaching space utilization

These will point out when there is a need for room or building extension or when existing teaching-spaces simply require renovation. By so doing building costs can be minimized and greater efficiency in the financial management of tertiary institutions can be achieved.

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