GHANA INSTITUTE OF MANAGEMENT AND PUBLIC ADMINISTRATION (GIMPA)

EVALUATION OF THE PERFORMANCE OF KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY SCHOOL OF MINES, TARKWA

BY

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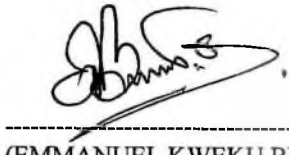
DECLARATION

I, .Emmanuel Kweku Bedai, hereby declare that this thesis "**Evaluation of the Performance of Kwame Nkrumah University of Science and Technology School of Mines, Tarkwa**" consists entirely of my own work produced from research undertaken under supervision and that no part of it has been presented for another degree elsewhere.



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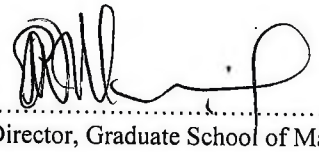

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DEDICATION

This thesis is dedicated to the memory of my late parents, Opanyin Jacob Kwabena Eduenin-Bedai and Maame Sophia Araba Ampiaba Crentsil, for their gift of nurturing and upbringing and for their concern and support for my education.

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I am, however, responsible for the thoughts, ideas and the presentations made in this thesis write-up. Any errors of omission or commission that may be found in the work are entirely my own.

E. K. B

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LIST OF ACRONYMS

URC		University Rationalization Committee
CIDA	-	Canadian International Development Agency
UNDP	-	United Nations Development Programme
GTZ		Gesellschaft Technische Zucamearbeit
JCR	-	Junior Common Room
KNUST	-	Kwame Nkrumah University of Science and Technology
KNUSTSM	-	Kwame Nkrumah University of Science and Technology, School of Mines
STR	-	Student: Teacher Ratio
CVCP	-	Committee of Vice Chancellors and Principals
IMME		Institute of Mining and Mineral Engineering
PLBS	-	Programme Linked Budgeting System
MTEF	-	Medium Term Expenditure Framework
UG		University of Ghana
UCC	-	University of Cape Coast
UCEW		University College of Education, Winneba
UDS		University of Development Studies
NGO		Non Governmental Organisation
SSS		Senior Secondary Schools
JSS		Junior Secondary Schools
FM		Frequency Modulation
ILO		International Labour Organisation
NCTE		National Council for Tertiary Education.
HEIs		Higher Educational Institutions

ABSTRACT

This study was aimed at evaluating the performance of the KNUSTSM, Tarkwa, for the period that it has existed as a tertiary institution todate, a time span of twenty-five years.

The School will celebrate, in October 2001, its silver jubilee of nurturing by the mother university, KNUST, Kumasi. Even though it is at the threshold of becoming a University College, no formal evaluation has been made about how the School has so far performed.

The study also sought to establish whether the experience of KNUSTSM, Tarkwa, as a nurtured institution could be used as a model for some other institutions in the country which could go through similar process into maturity. The study was done under the relevant aspects of the broad policy objectives of the reforms to the tertiary education system of Ghana (1990) which were also evaluated in 1998.

It was hypothesised that the KNUSTSM, Tarkwa, had not performed well; neither had it justified the mission for which it was established. The four broad criteria of evaluating higher education institutions as propounded by Ramson, Khoo and Selvaratnam (1993) and a fifth criterion identified by the researcher, were employed to evaluate the School.

The five broad evaluation criteria were broken further into twenty-nine sub-areas. Twenty two of the assessment criteria indicated positive performance of the School. Four of them proved negative and three of the items went in between positive and negative which means that they were debatable.

With twenty-two out of twenty nine items being positive indicators, the hypothesis has been proved wrong. The results clearly demonstrated that KNUSTSM, Tarkwa has performed excellently and has justified the mission for which it was set up. The results of the study have been summarised in a framework matrix.

The shortcomings of the School have been identified in the study and suggestions have been offered for redress as the School prepares itself to become a University College.

CHAPTER ONE

HIGHER EDUCATION IN THE CONTEXT OF DEVELOPMENT

1.0 Background

The world economy is changing as knowledge supplants physical capital as the source of present and future wealth. Technology is driving much of this process with information technology, biotechnology and other innovations leading to remarkable changes in the way we live and work today.

As knowledge becomes important so does higher education. Countries need to educate more of their young people to a higher standard. Currently, a degree is now a basic qualification required for many skilled jobs. The quality of knowledge generated within higher education institutions, and its availability to the wider economy is becoming increasingly critical to national competitiveness. This poses a serious challenge to the developing world.

Since the 1980s, many governments especially in the developing countries and international donors have not assigned higher education to a relatively high priority. Some educational analysts hold the view that public investment in higher education brings meagre returns compared to investment in primary and secondary education.

As a result, higher education systems in developing countries are under great strain. They are chronically under funded but face escalating demand. Approximately half of today's higher education students live in the developing world (Africa Insight, 2000). Academic staff are often inadequate, lack motivation and are poorly rewarded. Students are poorly taught and curricula

underdeveloped. Meanwhile developed countries are constantly raising the stakes. In effect many developing countries will need to work much harder just to maintain their position on the ladder of educational development, let alone catching up with the developed world.

1.1 Challenges of Education

A former president of the World Bank introducing a recent World Bank policy study on education indicated that "Without education, development will not occur. Only an educated people can command the skills necessary for sustainable economic growth and in a better quality of life" (Kwapong, 1988).

Kwapong (1988) has observed that Africa's recovery and sustainable development will depend on many important factors including the expansion, both qualitative and quantitative, of the continent's stock of human capital through education.

He reiterated further that between 1969 and 1983 the number of students enrolled in African institutions at all levels quintupled to about 63 million students. Enrolment increased about 9% annually between 1970 and 1980, double the rate in Asia and triple that in Latin America.

Despite this impressive record, it appears that the cardinal role of education in African development is not fully appreciated.

Education satisfies a basic human need for knowledge, provides a means of helping to meet other basic needs and helps sustain and accelerate overall development. It provides essential skilled manpower for both the formal and informal sectors of the economy, provides the means of developing knowledge,

skills and productive capacities of the labour force and acts as a catalyst in encouraging modern attitudes and aspirations.

Again, education helps to determine not only the income of the present generation but also the future distribution of income and employment. Education influences social welfare through its indirect effects on health, fertility and life expectancy and helps to increase the profitability of other forms of social and physical investment.

1.2 Higher Education and Development

Statistical analysis, case study, and common observation all point to the fundamental importance of higher education and development. Higher education promotes the following:

1.2.1 Income Growth

The validity of higher education is a fundamental and increasingly important determinant of a nation's position in the world economy. It contributes to labour productivity, entrepreneurial energy, and quality of life, enhances social mobility, encourages political participation, strengthens civil society and promotes democratic governance. It does this by creating public goods such as new knowledge which is a catalyst for rapid development and provides a safe space for the free and open discussion of the values that define the character of a nation's development.

Higher education promotes economic growth. It is therefore a powerful tool for poverty alleviation and improvements in people's lives. Higher education's contribution to growth, therefore, means better living standards for people of all levels of a society.

1.2.2 Enlightened Leaders

Higher education can give leaders the confidence, flexibility, breath of knowledge and technical skills needed to effectively confront the economic and political realities of the twenty-first century. It also generates cadres of well trained teachers for all levels of the education system.

1.2.3 Expanding Choices

Development is fundamentally concerned with expanding the choices people can make. As such, an accessible higher education system offers a wide range of quality options for study, bolsters social mobility and helps the talented to fulfil their potential.

1.2.4 Increasingly Relevant Skills

Higher education is absolutely necessary for training scientists, engineers and others to help invent, adopt, and operate modern technology in all sectors. When scientists in developing countries are inspired to define and address local problems, they are likely to contribute to appropriate solutions in such vital areas as environmental protection, the prevention and treatment of illness, industrial expansion and infrastructure provision.

These benefits are not automatic. They are linked to the character of higher education systems and institutions, as well as the broader social, political, and economic systems within which they are situated. Even a well functioning higher education system, operating under the most favourable of circumstances, is not sufficient for social and economic development.

But higher education will certainly be necessary in most countries if more vibrant development is to take place. Indeed, in most countries, especially those with

extreme low levels of per capita income, higher education initiatives will not dominate the policy agenda for the foreseeable future. Higher education will remain important for these countries, but they may do best by relying for the time being, on institutions outside their countries, possibly with donor assistance, as a prelude to building stronger higher education systems of their own (World Bank, 2000).

What is not certain is whether higher education matters more than other key sectors such as agriculture, health, transportation, and basic education. But it is absolutely clear that it is much more important to development than one would surmise from the comparative neglect it has received in most quarters of the international development community in recent decades.

Higher education's benefit must now be recognised more widely so it can take its place in the mainstream of the international agenda. The information revolution that is driving the new economy is dependent on educated and literate workers, and more than ever, the new ideas fuelling this expansion have come form people with tertiary degrees.

1.3 The Role of University

The aims and objectives of universities the world over have been expressed differently by different writers even though there is only a thin line in between the various opinions expressed. Lord Annan (1975) identified two major functions of universities. First, universities stand for promotion through reflection and research and second the transmission of high culture to each generation.

The traditional purpose of the university has been identified by Lockwood and Davis (1985) as "to search for truth, to discover, store and disseminate knowledge, and to be critical of society."

Universities, again, offer intellectual leadership through criticism and judgement (Stephens and Roderick, 1975).

Even though these aims are universal and are applicable to all universities in the world, there are peculiar problems and demands and aspirations of those countries.

Stephens and Rodericks (1975) quote Wilcos who provides a good account of the role of universities in the United States, Australia, Russia and China. They emphasise that in the American system, universities do not only provide intellectual but are also concerned with social adaptation in a technological society. The role of universities in Australia is to emphasise, in addition to the academic roles, the preparation for professions and service to society. The Russians viewed higher education as that which constituted and developed as an organic component of the unified system of the then socialist economy. In China higher education is useful to the proletariat politics, which is integrated with productive labour and their products and becomes what they call 'socialist consciousness and culture.'

In the developed world, universities are important for the economic emancipation of their economies. In the developing countries and Africa the numerous problems facing the governments make the role of universities more paramount and crucial.

Twum Barimah (1976) recounts the historical perspective of African universities and gives an overview of some of the early proponents thus "University education in particular is a singular facility for the development of national consciousness for the acquisition of the necessary knowledge and skills for the administration of the body politic and for general development of modernisation."

University education, in another instance, is expected to counteract the degeneracy of the African, restore self-respect and develop in him the qualities he would need for self governance.

Twum Barimah (1976) refers to Governor Roger of the Gold Coast who in 1909 highlighted the importance of university education when he reiterated that the objective to be kept in mind is that African boys and girls should be trained not merely to read and write the English language, but to develop the best in African custom and character for the enrichment of a definite culture.

University education has a potential role to integrate and unite Africa. This idea was echoed in 1962 in Tananarive, Malagasy Republic, at a conference on Development of Higher Education. At the time the role of the university was highlighted as to "encourage education and appreciation for African culture and heritage, dispelling misconceptions of Africa through research and teaching of African studies to ensure the rapid development of the human resources to meet Africa's manpower needs; to develop an awareness of local problems and aspirations and to evolve a truly African pattern of higher learning dedicated to Africa and its people."

In a paper delivered at an international seminar on Inter-University Co-operation in West Africa held in Sierra Leone in 1961, Ashby identified what he called the prime task of universities in West Africa. The task includes producing the manpower needs of the region and also integrate themselves into the West Africa society.

At a Harare conference organised by UNESCO, which dealt with policy and cooperation, in the sphere of education in Africa, Yacine Cisse (1982) reiterated the need for African universities to function and fit better into a new strategy designed to provide training, provide research and restore the cultural identity of African states towards development.

These views expressed show that so much is expected from the university to achieve, to a very large extent, the aspirations of the society. No wonder that financing education in Africa and much of the developing world became the responsibility of the entire society and for that matter the government.

The role of the Universities in Ghana from the beginning was to nurture an elite class; that is to produce men and women with standards of public service and capacity for leadership which self rule requires. They were to nurture an elite in Ghanaian society and to supply the manpower needs of Ghana. Indeed more than enough locally trained personnel are available for jobs for which a degree is a requirement.

The output of graduates from the four main universities entering the teaching profession in the second cycle institutions has caused a considerable reduction of the country's dependence on foreign teachers.

Table 1 shows the output of graduates (both degree and non degree) from the first three universities in Ghana from 1987 to 1994.

Table 1.1 **Output of Graduates - Universities in Ghana, 1987 – 1994**

Year	UG	UST	UCC
1987	1151	977	361
1988	1200	939	340
1989	1129	1211	313
1990	1489	1238	363
1991	1325	1267	320
1992	1439	1156	346
1993	1640	1280	500
1994	2036	1273	499

Source: The State of the Ghanaian Economy in 1995. ISSER, UG, Accra.

The increase in number of Ghanaian graduate teachers has had to meet the problem of replacing not only the expatriate graduate teachers but also with under-qualified Ghanaian teachers in second cycle institutions.

In other areas the contribution of the universities is not adequate. Industrialisation and industry related jobs call for a whole range of qualified skilled personnel. Currently there is still a shortage of scientists and skilled manpower to fill middle and senior industrial posts. A cursory examination of the supply and demand for such high level personnel indicates that the Universities tend to produce more graduates in the humanities, education and the social sciences rather than in the natural sciences, engineering, medical science and agriculture. As an illustration, between 1951 and 1974 the universities in Ghana turned out a total of 5,838 arts and social sciences graduates in contrast to a total of 4,234 science graduates (Antwi, 1992).

The universities have also made some impact on society through the organisation of courses for the public and through research into specific problems in agriculture, health, housing, social and economic issues affecting the country.

Contrary to the popular view, the universities are actively engaged in research into the country's problems. With limited facilities available in terms of equipment, money and other incentives the universities have achieved substantial results which are recorded and kept in files in the universities and in the ministries waiting to be utilized. Apart from organizational and financial relations with universities and with government there is scarcely a government commission of enquiry or advisory board which is not made up predominantly of persons drawn form the academic community. A great deal of consulting work is done for agencies by university teachers. Furthermore, in conformity with the trend, the University of Ghana, the University of Cape Coast and the Kwame Nkrumah University of Science and Technology, have offered several academic professional diploma courses instituted at the request of, or in consultation with, government.

1.4 Problems of Educational Development in Africa

Africa Insight (2000) has revealed that by the early 1980s international aid to education in sub-Saharan Africa equalled 15% of domestic public expenditure on education. Bearing in mind that running costs typically consume upward 80% of public educational expenditure in Africa, the salience of foreign aid (which is mainly allocated to capital projects) can be appreciated. It notes further that World Bank lending to education projects in Africa between 1992 and 1997 averaged US $227.06 million per annum. On the eve of Africa's independence in 1960 an adult literacy rate of 9% and primary, secondary and tertiary enrolment

ratios of respectively 44%, 5% and 1%, the time was ripe for an education revolution on the continent and education became a central policy issue in all newly independent African states.

The Addis Ababa Educational Conference of 1961 called for:

i. economic reforms from investment in education,

ii. economy in education,

iii. qualitative expansion of educational opportunities and

iv. the need to expand teacher training.

The conference set the following enrolment targets for Africa to achieve by 1980: Universal taught primary education, 23% secondary and 2% tertiary education (Africa Insight, 2000).

Spurred by their belief in the power of education to accomplish economic growth and to forge national unity, the Africa Insight continues to reiterate that the governments of the newly independent African states, pursuing the targets set at the Addis Ababa conference, launched massive education expansion programmes after 1961 to the point where education as a biggest single item on national budgets, claimed as a rule a quarter of governmental expenditure. In one exceptional case 45.8% of the 1988 public budget of Cote d'Ivoire was allocated to education. Table I .2 shows the conceptual post-independence enrolment explosion in Africa.

Table I.2 **The Growth in Enrolment in post-independence Africa.**

Level/Year	**1960 %**	**1970 %**	**1980 %**	**1990 %**	**1995 %**
Primary	44	57	78	76	78
Secondary	5	11	21	29	31
Tertiary	1	2	3	5	6

Source: Africa Insight (2000), Vol.30 No.1

1.5 Higher Education Institution Types

The Task Force on Higher Education and Society (World Bank, 2000) categorized the main types of higher education institutions that are typical with a higher education system. From the onset they distinguished between public, private not-for-profit, and private-for-profit institutions. To some extent the objectives of these institutions teaching, research and service - overlap. However there are also fundamental differences. Notions of the public count more heavily in defining the mission of public institutions than of private ones. Pubic institutions also tend to be subject to greater bureaucratic control, which limits their autonomy.

On the other hand they are more buffered from market forces, giving them a greater measure of stability. State regulations do affect private institutions, but generally leave them with much more autonomy than public institutions experience in academic, financial and personnel matters.

All private institutions must cover their costs, but private-for-profit institutions also have the generation of a surplus as a goal. These financial requirements impose considerable limits on their activities. Based on the characterization described the Task Force categorized the main types of institutions that are typical within a higher education system. These are:

- Research Universities
- Provincial or Regional Universities
- Professional Schools
- Vocational Schools
- Virtual Universities and Distance Learning.

1.5.1 Research Universities

Research Universities stand at the apogee of the educational pyramid. They tend to be public and certainly not for profit. Their prime goals are to achieve research excellence across many fields and provide high-quality education. These goals are pursued by having relatively light faculty teaching loads, emphasizing research accomplishments in recruitment and promotion decisions, adopting international standards for awarding degrees, and being highly selective in the students they admit. The Research Universities are mostly commonly connected to advances in knowledge, monitoring break-through in many fields and investigating ways to exploit important results for social private gain. The Research Universities have capacity for two main areas of concern:

i. They generally instruct for both first and post-graduate degrees, the instructions aimed at the country's most hardworking and best-prepared students.

ii. They have the capacity to offer the most complete programmes of general education.

1.5.2 Provincial or Regional Universities

This is the second key component of a higher education system and they are institutions that focus primarily on producing large numbers of graduates. They also emphasize teaching and the training of "job-ready" graduates, especially those who can meet local skills requirements in areas such as manufacturing, business, agriculture, forestry, fisheries and mining. They are commonly found in both the public and private sectors and tend to be geographically disposed such that collectively they are alike to cater for the many students who do not leave

home to attend school. Provincial or regional universities often produce the majority of a country's graduates and tend to lie on the heart of the system's expansion.

1.5.3 Professional Schools

These schools typically enrol students directly from high schools and offer study programmes that focus almost exclusively on technical training on areas such as law, medicine, business and teaching as well as other areas outside the jurisdiction of traditional arts and science facilities.

Most developing countries have an urgent need for individuals with specialized skills, so professional schools play a critical role in national development and often occupy a central place within developing country higher education system. For profit, private institutions, in particular can be directed into this area by market forces, concentrate on preparing students for careers with high private returns. Professional schools commonly pay little attention to providing a general education that would serve many students and the society as well.

1.5.4 Vocational Schools

Vocational Schools, except for operating at a different level, operate in much the same way as professional schools. They do well to impact the practical skills needed for specific jobs in areas such as nursing, auto-mechanics, book-keeping, computers, electronics and machining. The vocational schools may be parallel to, or could be part of the school educational system, or part of the post-secondary system, but they are not often considered a component of the higher education system per se. These schools, many of which are private and for-profit, play an important role in satisfying real labour-market demands.

1.5.5 Virtual Universities and Distance Learning

Distance Learning has the ability to reach students in remote areas and address the higher education needs mostly of adults. Distance learning can be offered by traditional institutions or by new institutions that specialize in this mode of study.

Recent developments in communication technology and computers have vastly increased the technical viability of distance education. Economic viability is still an issue in many countries because of costly and extensive infrastructure requirements.

In the past, distance learning has been seen mainly as a cost-effective means of meeting demand, with policy-makers paying inadequate attention to ensuring that it provides comparative quality to traditional modes of delivery.

The Task Force believes that distance education offers many existing possibilities. Innovative curricula can be combined with interactive internet-based technology and traditional, educational media such as television and print, written materials, and direct contact with tutors. It needs, however, to be thoroughly integrated into the wider higher educational system, subjected to appropriate accreditation and quality standards and linked to the outside world.

1.6 The Problem of Study

The universities in Ghana have come under much pressure to expand access to prospective students. Baafuor Kisiedu (2000) notes that whereas there were 820 university students at independence in 1957, 1200 in 1961 and 8400 in 1988, there were some staggering 32,000 enrolled in our universities alone by 1998.

However, physical infrastructural facilities have seen very little expansion due to the diminishing financial resources from government.

A World Bank study indicates that in 1990 the Government of Ghana expended the equivalent of nearly $2500 per university student for recurrent items and $180 per polytechnic student and the amounts were perceived to be enough to provide an acceptable standard of university education if used effectively and efficiently. By 1992 per student recurrent expenditure in the country's universities had fallen to roughly $2,000 and to $130 in the polytechnics.

The study revealed further that in the process of budget decision making for universities in Ghana, however, the 1997 amounts were reduced by 40% and the 1998 amounts by more than half. For the polytechnics the reductions were about 65%. The net effect was that per student expenditure was now only $900 at the university level and just $74 at the polytechnics.

In most developing countries, as is the case in Ghana, governments are the dominant source of university funding. The extent to which the financial requirements of the universities in Ghana are met is very germane to the achievement of their aims and objectives. Since government assistance to the Universities, including KNUST School of Mines, Tarkwa, has been dwindling, it is very difficult to fulfil the School's objective of providing teaching, research and extension services to the nation because of the heavy expenditures involved.

The vision of the School comprises the following:

i. To provide quality teaching and learning in Earth Sciences and Engineering

ii. To develop the School into a centre of excellence for active research

iii. To provide professional service through consultancy and extension activities. (KNUST, 1983).

The major import of the vision is to increase accessibility of Ghanaians and non-Ghanaians to tertiary education that trains quality engineers for the mining and allied industries. The framework for the achievement of the vision of the School is closely linked up with the policy objectives of the reforms to the Tertiary Education System of Ghana. The relevant policy objectives of the Tertiary Reform System (Government of Ghana, 1998) which have a direct bearing on the reasons for the establishment of the School have been listed as:

i. To make tertiary education more cost-effective and able to provide quality education for increasing numbers through increased efficiency in the utilization of space, resources and personnel (objective 3)

ii. To provide for greater access to tertiary education for qualified people and significantly increase the proportion of women students (objective 5)

iii. To restructure enrolment and output to achieve an appropriate balance in the provision of skills in Science, Technology, Social Sciences, Humanities and the Arts in relation to national needs (objective 6)

iv. To introduce programmes and courses geared to the essential training needs of working people for national development (objective 9)

v. To ensure an overall balance between the supply of trained personnel from the tertiary institutions and labour market demand (objective 10)

vi. To improve the internal administration of all tertiary teaching institutions (objective 11)

Over the quarter century of the School's existence as a tertiary institution no formal objective evaluation has been done about its performance. It is not certain, therefore, whether the School has been able to achieve the objectives for which it was established. The problem is to investigate the weaknesses and the threats which face the KNUSTSM Tarkwa, as compared to the strengths and the opportunities that the School has in order to establish a fact as to its successes or otherwise.

1.7 Hypothesis

It is hypothesized in this study that the KNUST School of Mines at Tarkwa has not performed well neither has it fulfilled its mission and fully justified the reasons for its establishment.

1.8 Objective/Purpose of Study

The objective or purpose of the research is to study and make an objective analysis of the performance of the School. The outcome of the research can be used to arrive at some realistic conclusions about its existence. With that it would be easy to propose some suggestions for the future especially when the School is being prepared to become a University College.

1.9 Justification for the Study

A World Bank mission visited Ghana in February 1988 to monitor the Bank's Supported Tertiary Education Project. The team was also tasked with contributing to initial thinking on the formulation of a sector-wide approach for World Bank assistance to Ghana education. The mission got shocked by the erosion, during the previous year, of the key portions of the country's long standing policy framework for tertiary education and by the implications of this

for educational standards. The group was also moved by the clear sense of frustration and discouragement expressed by a wide range of stakeholders in the tertiary education community. It would thus seem that the contributions of tertiary education institutions including KNUST School of Mines, Tarkwa, to provide high level skills could easily be thought of as being minimal.

As part of the Economic Recovery Programme, extensive support was given to the School for its rehabilitation, equipment and extension through a technical assistance programme supported by the German Technical Assistance Project (GTZ) and the Technical University of Berlin in Germany. The School has embarked upon organising a rehabilitation programme of its classrooms, library and hostels and, according to the University Rationalization Study Interim Report (1987), has the best equipped laboratories of all the universities.

The University Rationalization Committee (URC) Interim Report (Government of Ghana, 1987) endorsed and supported the developments at Tarkwa and urged that these developments be brought to their logical conclusion through the granting of university status to KNUST School of Mines, Tarkwa, which would eliminate the duplication inherent in the current arrangements. In order to achieve this the URC recommended that the KNUST School of Mines at Kumasi be transferred to Tarkwa. Following this transfer the incoming Department of Mineral Processing and Extractive Metallurgy should be merged with that of Mineral Technology under the name to be chosen by the merged Department. So would be the two departments, the Department of Geology and Survey at Tarkwa and the Department of Geological Engineering in Kumasi.

There are five main universities and eight polytechnics operating as tertiary institutions in Ghana. Only one university has science and technology as its main focus which is a prerequisite and a sine qua non for development. The KNUST School of Mines, Tarkwa, is not only science and technology biased but the only one specialized in mining and the related disciplines. The heavy investments made, and which continue to be made, suggest that the School has a projected long life. As to whether it should continue to exist and function in the manner that it has done so far is the question which needs investigation. The justification for the study, therefore, will be:

i. to provide research findings which will be of particular interest to stakeholders and to provide a framework for evaluation of KNUSTSM, Tarkwa, and other tertiary institutions in Ghana,
ii. to assess whether it was useful to further invest in the School and to draw lessons for other institutions which can exist as satellite institutions of the main university systems of the country,
iii. to assess the School's contribution to technical manpower development,
iv. to examine how science based education can be replicated using the Tarkwa experience as a model,
v. to evaluate whether the School has contributed positively to the policy formulation on Science Education and the overall objectives of the Tertiary Education Reform System.

1.10 Methodology

This research demanded an understanding of the performance of a higher education institution in the context of teaching, research and extension. Both primary and secondary data were sourced for analysis. The secondary data were

collected from the School's administration, various libraries and the National Council for Tertiary Education. Primary data required for analysis involved the use of surveys which involve questioning people or respondents for relevant information. These could either be verbal or through written questionnaire. Zikmund (1982) describe the survey method as providing quick, but inexpensive, efficient and accurate means of accessing information about a population.

1.10.1 Sampling

The study population was made up of the students of the School during the 2000/2001 academic year, the academic staff of the School, the top administrative staff of KNUST and the general public, specifically those which have interactions with the School. The sampling frame, based on the cluster sampling technique, was put into the following categories:

(a) Students

(b) Academic staff

  (i) Heads of Academic Departments

  (ii) Lecturers

(c) University Administrators

  (i) Vice Chancellor

  (ii) Registrar

  (iii) Director, IMME

  (iv) Principal, KNUSTSM, Tarkwa

(d) General Public (Heads of institutions which have links with the School).

The different classes of students both degree and diploma (except those in their first years) were chosen as the sampling units. They were from all the study areas which are:

Mining Engineering

Geological Engineering

Mine Surveying

Mineral Engineering

Mine Mechanical Engineering and

Mine Electrical Engineering

At the time of conducting the research, the first year students were in their first semester in the School. They had not spent enough time in the School to be able to make reliable assessment of its performance. The remaining classes totalled 20 from which six students from each class were randomly sampled.

This means that each student in the sampled classes had the same probability of being selected.

1.10.2 **Sample Size**

The following criteria became paramount in the determination of the sample size: The students were very important because of their relatively large size. Again, the largest function of the University which is teaching hinge basically around the students. In effect the University exists because of its biggest clients, the students.

The second most important parameter considered to select the sample size was the academic staff (lecturers) who are directly in charge of disseminating knowledge to the students which is the primary objective of the University. The

lecturers constitute the greatest percentage of the membership of the committee systems from which a lot of administrative decisions of the University emanate.

The third consideration, the top administrators, represents the group which is responsible for implementing University policies and decisions.

The general public, particularly the external assessor, which is the fourth factor, reflect the image of the University from the perspective of outsiders. They act as mirror in which the University sees its on personality.

A sampling size of 159 was arrived at based on the following breakdown:

Students	-	120
Academic Staff	-	24
Top University Administrators		3
Peer Organisations		11
External Assessor		1
Total		159

The population consisted the following:

Students		618
Academic Staff	-	24
Top University Administrators		3
Peer Organisations	-	A number of partner organizations of KNUSTSM, Tarkwa
External Assessor	-	1

1.10.3 Data Collection Method

1.10.3.1 Research Design

Both literature research (secondary data) and the survey methods (primary data) were important for this research work. By the survey method, questionnaires and question guides (largely the structured type) were administered on the sampled population. This method was also used to gather views, information and ideas from the various stakeholders to cover the salient areas of higher education evaluation. The questions covered the following areas:

(i) teaching

(ii) research and

(iii) extension services

Even though the questionnaires were largely self-administered, personal contacts were also made with some interviewees on whom were administered the question guide which involved more detailed and extensive discussions. The questions were both close and open ended.

All the interviewees were offered the opportunity to skim through the questions for clarification on areas which could pose difficulty in understanding.

1.10.4 Data Analysis

The researcher employed the univariate statistical analysis method. This method involves summarizing large quantities of raw data in a way such that the results can be interpreted. It requires rearrangement, ordering and manipulation of the data to provide descriptive information so that the results could be studied and interpreted in a summarized meaningful way.

Zikmund (1982) notes descriptive analysis as referring to "the transformation of the raw data into an understandable form so that the interpretation of it will not be difficult. Therefore the responses got from the questionnaires and the question guides were tallied and tabulated. Tabulation is the orderly arrangement of data in a summary format, usually in a tabular form. To this end two techniques were employed, percentages and measures of central tendency.

For analytical purposes, the sources of the data for analysis were categorized into three: students, university staff and the general public. The university staff were also categorized into three: the top hierarchy of the university administrators who oversee the running of the KNUST School of Mines, Tarkwa, from Kumasi, the heads of the academic departments and the lecturers of the School. The general public were categorized into heads of ministries, departments and agencies, non-governmental organizations and top officials of some mining concerns most of whom are alumni of the School.

1.10.5 **Instrumentation and Measurement**

The idea of the analysis was to establish a fact as to whether the School has lived to fulfil the purpose for which it was established. To be able to take a position a checklist was prepared using an analytical framework matrix on which the results were checked. Where the analysis gave a positive contribution to the development of the School, a positive (plus) sign was used to check it on the matrix; where the result was negative a negative (minus) sign was used to indicate it. In the case of a doubtful or unclear result a question mark was used as the sign.

At the end of the analysis the number of positive and negative signs as well as the question marks were added up. The final total figures were then considered to check on the direction and the path that the School has followed so far. This was what was used to test the hypothesis.

Finally a conclusion was drawn from the findings about the performance of the School, followed by a summary and recommendations for its future performance.

1.10.6 **Conceptual Framework**

In this research, the idea of evaluating the KNUST School of Mines at Tarkwa should be understood in the context of an input-output relationship or better still cost-benefit or cost-effectiveness relationship.

Evaluation is the process of gathering and analysing information to determine:

i. whether a project, an establishment or a venture is carrying out its planned activities.
ii. the extent to which the project is achieving its stated objectives through these activities.

Cost-benefit analysis, on the other hand, sets out to answer whether a number of investments A, B, C, D and so on should be undertaken and if funds are limited, which of the projects should be selected. Hence, the objective is profitability. An evaluation is, therefore, being made about the KNUSTSM Tarkwa, as to its raison d'etre and the extent to which the objectives are being achieved.

The inputs or the costs include facilities and resources which are placed at the disposal of both the students and staff, particularly the teaching staff. These

include classroom space, laboratory and library facilities, teaching aids, equipment, the investments in the training of staff and students (including attachment programmes) and the funding situation among others. The output or the benefits (the profitability criteria) is measured in terms of the number and the general academic performance of students trained, the quality and quantity of research undertaken by the staff, the service and extension activities undertaken by the School and its relationship with the community in which it is situated and the larger Ghanaian and international community. The comments from both internal and external assessors are as well important.

1.10.7 Scope/Limitations of the Study

The study focused on the performance of the KNUST School of Mines at Tarkwa after twenty-five years of existence as part of a tertiary system of education. It used some of its evaluation criteria from the government's policy objectives of the reforms to tertiary education in Ghana. The performance criteria are grouped under the broad categories of teaching, research and extension.

Owing to constraints of time and financial resources the evaluation could not be carried out in the context of the overall performance of tertiary education institutions in Ghana.

The evaluation of the performance of the School is with respect to the last twenty-five years of its existence as a tertiary educational system. The School has existed for almost half a century at which inception it served the purpose of offering instructions in craft practices for mine workers on sandwich basis. The focus and direction of the School has shifted and therefore the conclusions made,

based on the data used, should be applicable from the time it was absorbed into the tertiary education system and not the entire span of its existence.

1.10.8 Organization of the Study

This research thesis has been organized under five chapters. The first chapter covers the introduction, touching on the background, purpose, justification, methodology, conceptual framework, scope and limitations and the organization of the research work. The second chapter is devoted to review of literature on tertiary education with a focus on cost-benefit and evaluation criteria for assessing the performance of a tertiary institution. The third chapter highlights basic facts about the School, giving a historical development through to facts on current statistics. The information gathered, by way of hard facts and data collected through the administration of questionnaires and question guides (Appendix 1), has been analysed in the fourth chapter. The fifth chapter being the last concludes the work with a summary and recommendations.

CHAPTER TWO

LITERATURE REVIEW ON EVALUATION CRITERIA FOR ASSESSING HIGHER EDUCATION

2.0 Introduction

The Government's white paper on the Reforms to the Tertiary Education System has provided guidelines to the policies and practice of tertiary education since 1990. These reforms were intended, among others, to improve the quality of, and increased access to tertiary education, provide a sustainable basis for funding and create institutions to monitor and evaluate policy performance in the tertiary sub-sector.

This chapter reviews a wide spectrum of literature on higher education with a focus on evaluation criteria and cost-benefit methods. The idea is to develop a yardstick by which the KNUST School of Mines at Tarkwa can be evaluated. These are preceded by a historical perspective of the development of modern universities and the roots of major conflictual relationships in African universities.

The use to which the evaluation criteria will be made to assess the performance of the KNUST School of Mines, Tarkwa, is also discussed.

2.1 Development of Modern Universities

Modern universities began in Europe in the eleventh century. Before then, higher level institutions as noted by Albrecht and Ziderman (1992), took the form of students hiring teachers. Students in India, for example, attended the homes of Brahim scholars who were hired and paid on the basis of their academic and moral reputation.

Whereas in China, private scholars developed to train people to become scholar administrators, in Ancient Greece students paid itinerant scholars for moral and

scientific training that was intended to prepare them in public political life of the polis as well as to help them enlarge their private fortunes.

Again, as Albrecht and Ziderman observed, in the Islamic World, students could hire teachers inside mosques for religious instruction. That explains why up to this day the al-Azhard University has preserved the tradition of students hiring scholars in the central mosque.

In Europe, and during the renaissance era, higher education institutions flourished and were financed mostly by the Catholic Church. Two major prototypes for this collective university arrangement emerged. In Bologna, the institution was organised by students who elected the administrative personnel for the institution. This was the student-dominated prototype which became common throughout Southern Europe in contrast to Paris where teachers administered the university.

The system then went through some developments. The first instances of largely state-supported universities developed in Germany and France at the beginning of the nineteenth century. The clear rational for state intervention was to provide the necessary technical manpower for the state to foster industrial development and for work in government as were the cases with the University of Berlin and the Ecole Polytechnic in Paris. The Ecoles Normales, on the contrary, were established to supply sufficient teachers for the universities and secondary schools. Therefore, every European country followed in establishing publicly supported national university systems.

The universities, with time, became employer based training facilities with the government as the primary employer meeting the educational costs. These systems

expanded rapidly throughout the world in the twentieth century, particularly as more countries sought to industrialise. Then onwards, "the pattern of publicly supported institutions to provide administrative and technical manpower was exported to many developing countries that were colonies of European powers." (Albrecht and Ziderman, 1992).

The universities initially trained the 'colonials' living in the country for the civil service, and it became a less expensive option than educating them at home. A selected few from the indigenous populations who had had some education were hand picked to staff the local government service.

The structure for the university systems was already in place when these countries achieved independence and most governments chose to expand these institutions rapidly to replace the manpower void created by colonial withdrawal.

This strategy was pursued by Ghana after independence because it was observed that there was a close relationship between education and development. The Kwame Nkrumah University of Science and Technology and the University of Cape Coast were established as the second and third universities respectively to follow the then existing University of Ghana. The University College of Education at Winneba and the University for Development Studies have added up to bring to five the number of public universities currently in Ghana.

2.2 Conflictual Relationships in African Universities

The foreign origins of African universities made them adopt without question "the fundamental pattern of British civic universities on constitution, in standards and curricula, in social purpose... And as for their social function,... they were, as in

England, to nurture an elite" (Ashby, 1964). It is this founding philosophy which posed several problems for the new African societies.

The first problem relates to the idea of autonomous institutions which seemed unrealistic in the newly independent African countries. These did not have any previous experience with Western style universities. Moreover the economic dependence of these institutions on their governments was not conducive to the notion of independence of action. The system worked well in Britain probably because there existed well established and acceptable conventions governing relations between universities and the state. This was not exactly the case in the new independent African countries.

Quoting Ashby (1964), Mwiria (1992), identifies the second source of conflictual relationship as emerging from African universities which were seen, and are still considered, as viable and prestigious institutions over which African heads of state wanted to exercise maximum control. For this reason, most African heads of state are the titular heads of their countries' universities and ensure also that most of the key university administrators and council members are their nominees.

Following from this development key policy matters are very much in the hands of the government while academics only have a say in the determination of academic policies in most Anglophone universities.

The third problem as identified by Ashby is the creation of the preoccupation with nurturing an elite ruling class. He observes that students of the new universities not only enjoyed privileges beyond the reach of the majority of the population but were also guaranteed high profile positions upon graduation. African governments can

neither afford the financial resources to cater for high living standards for university students nor guarantee these students employment upon graduation, especially as the economies of most African countries decline and enrolment in universities soar.

Students have tended to tie their expectations to the experiences of their predecessors during the first two decades of university education in Africa. For that matter they have not been prepared to live with the current realities.

The fourth problem created by the foreign origins of the university is the way different interest groups perceive the role of universities. On the one hand, academics and students see the main role of the university as that of promoting the pursuit of knowledge, even if such a pursuit be for its own sake. The post-independent African politicians on the other hand have contested this view. They see universities as valuable institutions whose main goal should be that of generating 'relevant' high level manpower. For this reason President Kwame Nkrumah, on several occasions castigated the University of Ghana for not initiating reforms consistent with the country's needs and warned that "if reforms do not come from within, we intend to impose them from outside and no resort to the cry of academic freedom ... is going to restrain us from seeing that our university is a healthy university devoted to Ghanaian interests..." (Ashby, 1964).

This view of evaluating the relevance of universities was later to be embraced by other African leaders with its best support from President Julius Nyerere of Tanzania. In essence some African leaders, led by Nkrumah and Nyerere were calling on the African university to "shed its foreign forms and cloak; it must not just pursue knowledge for its own sake, but for the sake of, and the amelioration of the conditions of the life and work of the ordinary man and woman. It must be fully committed to

active participation in the social transformation, economic modernisation, and the training and upgrading of the total human resources of the nation ..." (Yusufu, 1971), cited by Kilemi Mwiria (1992).

A major source of conflict, a fifth, in universities which is related to the funding crisis, has to do with the declining academic standards and the inability of administration to halt the decline. This problem has been addressed by student leaders of the Universities of Makerere and Zambia. D.E. Dombo, Student Government President at Makerere complained that "Lecturers are inadequate because they are poorly paid. Makerere has become a poaching ground for everybody - parastatals, the government and international organisations. Rarely do we have enough lecturers. Lecturers have no research funds and the library has very few useful books..."

The complaint is remarkable in the sense that university students in Africa have mainly tended to complain most about living conditions and allowances and have cared little about the real university crisis in Africa, namely the declining quality of university education, a complaint for which students are likely to find many sympathisers (Nkinyanki, 1991).

The measure of how well Africa's universities have served their societies cannot be limited to the number of graduates they have turned out. Focus may now be turned not only on the relevance of existing programmes but also on the quality of the graduates coming out of sub-Saharan African universities. As Goma (1989) has warned, "if the training of the graduates (university) is poor in quality, their contribution to society will be inferior. The best interest of our countries cannot and will not be served by mediocrity".

In deed, as Goma notes the task of searching for ways out of this predicament is an urgent one for sub-Saharan African universities. The quality crisis may prove difficult to address, given that the economic and political environments in which these universities operate have not been particularly favourable (Mwiria, 1992).

These problems, therefore, call for the need to scientifically evaluate and measure the quality (performance) of a higher educational institution, based on acceptable assessment criteria.

2.3 Terminology for the Process of Evaluation

Many terms have been used to denote the process of assessing the outcomes of institutions in relation to goals and the resources employed to achieve them including accountability, evaluation, auditing, inspection and monitoring. Castel, Patal and Verspoor (1993) identified two areas by which higher educational institutions could be assessed. The first is the evaluation of higher education institution's academic quality to assess the calibre of instruction, research and student achievement, usually done by academic peers. The second evaluation for accountability, is to assess higher education institution's teaching and research programmes in terms of costs and benefits, usually carried out by funding agencies.

Castel et al continue to assert that for evaluation to be effective, they must not focus solely on results, outcomes, outputs or impacts. They must consider inputs, the reason why certain outcomes occur, and how to improve future performance. They identify three situations which can possibly result in confusion over terminology. These are environments:

- of uncertainty about how funds are spent and the quality of results achieved.

- of mistrust about the purpose of evaluation
- where those who commission the evaluation have more power over how its results are used than those conducting the evaluation or being evaluated.

They suggest further that evaluation should not be punitive or tied to changes in resource allocation. It should rather be an exercise that allows actors in institutions to improve their future performance.

2.4 The Role of Evaluation

Evaluation of Higher Educational Institutions has the role of gaining and improving their overall performance especially their achievements in instruction, research and student learning. There have been increased concerns about maintaining quality standards and justifying resource use. This has stemmed from the rapid expansion of higher education and its restructuring to meet the diversity in students' academic backgrounds and needs. Castel et al have identified this as the factor which explains the growing prominence of evaluating what universities do to guide future funding, development and innovation policies.

Evaluation is also important for accountability. Universities should be held accountable for their efforts and outcomes in terms of costs and benefits of university programmes particularly in the developing countries. The fact is that there have been rapid expansion and diversification of formerly elite systems and therefore there is the need to do more with the same or fewer resources. National governments and international funding bodies need to know how well universities use their physical and financial resources and how well they serve the labour market and contribute to economic development.

Ongoing evaluation directed at the information needs of decision makers and administrators will improve the efficiency and effectiveness of universities.

2.5 Institutional Objectives and Evaluation

Ransom, Khoo and Selvaratnam (1993) have questioned the integrity and purpose of evaluation which does not take into account the institution's mission, goals and aspirations. Internally defined evaluation goals determine the ease with which an evaluation culture based on mutual trust, acceptance and consultative co-operation develop.

The goals also determine the degree to which evaluation outcomes will be used to overcome weaknesses and improve performance. Indonesia and Chile, for example, link evaluation to positive changes such as promise of additional funds for good performance or overcoming particular weaknesses and shortcomings. They reiterate that linking evaluation to goals and aspirations also helps to identify the appropriate evaluation approach, method or instruction, for example long term, short term or continuous internal or external approach, direct or indirect method.

2.6 Methods of Evaluation

Most evaluations employ a mixture of information gathering methods. Ransom, Khoo and Selvaratnam (1993) identified four methods by which Higher Education Institutions, particularly the countries of the Organisation of Economic Development, are evaluated.

The first method is by direct measurement which, for example, may evaluate student achievement tests and observations of performance. The second method is by quantitative indicators linked to inputs, processes and outcomes. Thirdly evaluation

may be made through statements by those directly involved in the institution being evaluated, namely students, staff and administrators and the fourth through statements of external experts or peers.

Ransom et al have observed that the direct measurement method yields the most indisputable results, but it is time consuming and costly to develop and use the instruments. But it is also difficult to compare different activities the reason being that the information that direct measurement provides is more acceptable when it is linked up to specific activities such as curricula and research.

Many educators favour quantitative indicators because the information they yield is based on objective measurable data that can be presented in a short aggregate form. The use of indicators which employ similar statistical scales to measure different types of processes and outputs does increase the comparability of the information so gathered. Indicators are, however, hampered by the inaccessibility of data and the tendency to select indicators which are based on the ease of access to data rather than the indicators' explanatory power in relation to the problem being analysed. The usefulness of indicators are appreciated most if they are related to the underlying quality of the efficiency criteria being measured. Ranson et al caution that indicators should not be used as the sole source of evaluating information. Their explanatory power is used in conjunction with other methods.

Actors' statements allow a broad range of information to be gathered with less effort and fewer costs. This method also ensures against bias through representative samples. Some people have criticised one type of instrument in this method which is graduate surveys. They assert that it exaggerates the links between the education received and professional success in the work place.

The most common evaluation method used in higher education world wide is statements by external experts. External experts are viewed to be impartial, distinguished peers and give their findings weight. They are said to observe and analyse a broad spectrum of issues with more latitude and depth, in less time, and at lower cost than standardised procedures allow. However, they are said to be often too subjective and base their judgements on their theoretical or ideological views rather than on vigorous analysis of data.

Two important conclusions can be drawn from the methods of evaluation reviewed. The first is that conventional approaches to evaluation may not allow for the university's programmes of study in the pursuit of constantly evolving knowledge. Ransom et al have rightly noted that unlike business and industry, higher education goals often cannot be clearly stated and consistently pursued. New evaluation approaches take into account the evolving nature of higher education in response to internal and external circumstances and consequently the need to constantly redefine and revise the goals of higher education. Such approaches, they asset, emphasise the impact of personal interaction, mutual understanding and actor participation in shaping and refining goals. In effect approaches and methods evolve over time in response to higher education institutions' changing mission, structure and funding sources.

The second observation is that ultimately the various approaches complement each other. A mix of approaches, though more costly in terms of resources, increases the explanatory power and reliability of a single method and the utility of evaluation outcomes.

2.7 Evaluation for Accountability

Evaluation is useful for accountability. In counties such as China evaluation is crucial where the higher education sector is very large and expanding and external funding is used for assisting development.

It is important for policy makers to know whether government or donor funds are being utilised judiciously. The result of evaluation can ensure better use for financial and physical resources and better matching of outcomes to mutual needs.

Indonesia has 44 national universities and 900 private institutions spread over thousands of islands. Such a country should naturally be concerned with accountability on the expenditure of funds. In Cameroon evaluation revealed that a student takes an average of 18 years to finish a three year programme and that a four year programme to train medical interns cost US $300,000, and that some faculties have 130 staff for fifty students (Ransom et al, 1993).

The country, therefore, recognises the usefulness of such information for planning and decision making and is adopting ongoing institutional and programme evaluation with the use of common methodologies that permit comparisons among institutions and programmes.

At the other extreme is Uganda where more than 80% of the university budget is devoted to student housing and board while libraries go lacking. This has created a situation of perpetual insufficiency of funding.

2.8 Evaluation and Academic Quality

Academic quality may be evaluated to determine whether a university has achieved its academic goals and reached the standards it has set for instructions, research and

student achievement. The quality of teaching and research staff is a major determinant of the quality of graduates and the research carried out and their eventual impact on the labour market and economic development.

Quality can be encouraged by such measures as ongoing formal evaluation processes that could be linked to promotions and allocation of research grant.

The next quality is that of accreditation. The problem of degree accreditation is very real in many developing countries. Non recognition of degrees prevents graduates from further studies at other centres of learning and obstructing promotions and research efforts. Proper and objective evaluations are necessary to establish standards achieved and to ensure universal acceptance.

2.9 Evaluation Principles and Developing Countries

To increase mutual trust and support for the evaluation process and consequently the accuracy, reliability and utility of the information collected, developing countries should develop a code of ethics about the methods of information collection and analysis and the use made of evaluation results.

Various developing countries practice a range of approaches. In Mexico, higher education institutions practice self-evaluation and the results are not made public. In Zimbabwe the university and the government carry out comprehensive joint reviews, but there is no continuous follow up. China, on the other hand, has established an academic commission to carry out peer group performance reviews of institutions and programmes that cover internal and external efficiency and the quality of academic work.

The difficulty of gathering comparative data on key indicators of different programmes and units may make statements from actors a more viable complementary evaluation approach in developing countries. This is especially so as successful surveys of actors for a high degree of co-operation between the various higher education actors needed for evaluation leads to improvement.

The developing countries need to enlarge their evaluation capacity by training experts in evaluation and developing appropriate evaluation instruments.

2.10 Measuring Benefits and Costs

The valuation of an activity, a project or a programme is done through measuring the costs incurred and the benefits accrued over time. However Musgrave and Musgrave (1976) assert that it is not enough to say that all 'relevant' costs and benefits should be included in the valuation exercise. The problem, they say, is to identify which costs and benefits are relevant and the method by which they should be valued. They hold the view that in dealing with this issue we first disregard the time dimension and assume that all costs and benefits will accrue at once.

Benefits and costs may be real or pecuniary. The real benefits and costs, on the other hand could be direct or indirect, tangible or intangible, final or intermediate, inside or outside, as the case may be.

2.11 Measuring Tangible Costs and Benefits

Tangible benefits result as, for example, government operates a public enterprise which sells in the market like the postal service. In other operations tangible benefits result from free provision of goods like housing which could be provided by the

market. In other instances as noted by Musgrave and Musgrave, benefits are clearly intangible, as in the case of national defence.

In still other situations, both tangible and intangible benefits may result. Therefore evaluation may yield intangible benefits through cultural enrichment and functioning of say the democratic process. In like manner costs may be partly tangible as, for example, the cost of the resource input into the construction of a super highway and partly intangible as in the case of damage to the beauty of a wilderness area.

Wherever intangible benefits and costs are involved, measurement takes us back to the central problem of social-good evaluation. Cost-benefit analysis is most applied in those areas where benefits are tangible and there is least need for public provision to begin with.

Even though evaluation of benefits may be difficult, Musgrave and Musgrave opine that analysis may be helpful in two respects. Firstly, they may point out where benefit like gains in literacy result from particular projects. This, at least, gives a basis for valuing these end results in money terms. Secondly, they may determine how desired results may be maximised with given inputs. The analysis, therefore, may compare the effectiveness, in achieving a certain objective, of spending a given amount in alternative ways. This approach referred to as 'cost-effectiveness' analysis is helpful even though the valuation of the end product may be difficult.

2.12 Problems of Cost-Benefit Analysis

Most government projects and policies may result in the private sector having more of some scarce commodities and less of others. At the core of cost-benefit analysis there

is a set of systematic procedures for valuing these commodities which allows policy analysis to determine whether a project is, on balance, beneficial.

Rosen (1995) notes that "cost-benefit analysis allows policy makers to attempt to do what well functioning markets do automatically - allocate resources to a project as long as the marginal social costs exceeds the marginal social benefits."

Cost-benefit analysis, however, does not provide a panacea that offers a definitive "scientific" answer to every question. When it comes to assigning money values to such intangibles as national security or environmental priority, the tools of cost-benefit analysis provide no easy solution. Using a cost-benefit analysis, nevertheless, helps to ensure consistent decision making that focuses on the right issues.

No matter how ingenious the investigator, Rosen opines that some benefits and costs seem impossible. Creating national parks gives people the thrill of enjoying beautiful scenery. The mind boggles at putting a money value on these commodities

2.13 Contemporary Views on Higher Education

Contemporary Higher Education Institutions have stood for teaching, research and extension services as their major areas of operation. Dage (1993) asserts that there is need to re-emphasise teaching and undergraduate education. He notes, however, that the university must not fall into simple-minded dichotomies of teaching versus research. Rather exemplary teaching, research and service must all be carefully linked to complement each other and provide a creative and exciting atmosphere for discovery, learning and development for faculty and students.

Dage continues with the argument that students must be taught by faculty who themselves continue to learn through scholarship and whose classroom teaching is of

the highest quality and scholarship. He believes that the university of tomorrow will be far different from the university of today. and contends that today higher education and much of government and public service are like a plant being pulled out of the ground to examine its roots.

He identified the current situation to include budget shortfalls, public dissatisfaction with undergraduate teaching, elitism, misconduct in research, high administrative costs, the shifting of programme costs to the states and increased accountability. The shape of higher education would be significantly changed at the dawn of the twenty first century.

Leadership initiatives must be taken in balancing multiple missions in teaching, research and public service and as Dage (1993) notes, "it is clear that the healthy academic environment of the future must clearly support an integration of teaching, research and service for the benefit of the consumer the public who either does or does not support the university system.

The 'Winds of Change' have been influenced by continuing state budget deficits; rapidly growing human service demands far beyond the state's resource structure to accommodate them, a lack of strategic planning and priorities which has caused us to stumble from crisis to crisis and rapidly changing demographics. There are areas of state government which must be competed with for funding even though often the universities' needs are classified as a lower priority.

2.13.1 **Higher Education Quality and Graduate Output in Ghana**

Ivan Addae-Mensah (1999) provides two criteria for assessing teaching in tertiary institutions – sufficiency and efficiency (effectiveness) principles.

By sufficiency he means that as student numbers increase so should academic staff increase proportionately. He utilises age profile analysis to explain the effectiveness criterion and states that ideally the majority of the teaching staff in the university should be 45 years or below.

Using Legon as a case study, Addae Mensah paints a picture which is replicated in two other universities in Ghana. While the number of student enrolment at Legon increased from 3,000 in 1992 to 10,000 in 1999, the academic staff dropped form 583 in 1996 to 511 in 1997 (sufficiency principle). An appreciable number of the present academic staff at Legon are above 50 years. In 1996 165 of the lecturers were between the ages of 51 and 60 while in 1997 the figure rose to 184 (efficiency principle).

In 1997 about 73 of the academic staff of Legon either retired or resigned with an appreciable number of the remaining with ages above 50 years. The trend shows that more lecturers were retiring with few being recruited and retained, trends which impact negatively an teaching and lecturing in the university. The Legon experience is almost a replica of the existing situation at the Kwame Nkrumah University of Science and Technology and the University of Cape Coast.

In addition to the problems of sufficiency and efficiency are inadequate facilities in the Ghanaian universities which are the result of a number of factors including over population, expansion of basic and secondary education which have put a lot of strain on resources of the universities.

2.14 The Theoretical Framework: Evaluation Criteria for Assessing KNUST School of Mines, Tarkwa

The purpose of evaluation is to review the performance of an entity, a group or an organisation. Assessment of the School is to be done under the broad functions of modern university systems. These are teaching, research and extension services. The most important function of teaching is to be assessed under quality of graduates as propounded by Goma (1989) and Mwiria (1992) as well as the relevance of existing programmes of the university system.

Quality of teaching and the relevance of existing programmes have of late become two very important items of evaluation of standard of teaching in higher institutions. On that score the research is to throw light on the courses run at the School and the order in which they were introduced. Courses phased out will be discussed and the reasons assigned for this development will be explained.

The quality of teaching and the relevance of programmes hinge heavily on the quality of the teaching staff with respect to their academic qualifications as well as on their access to continuing education. In this respect an assessment is to be made about the academic qualifications of the faculty (teaching staff) at post, specifically on those who had been assisted by the School to earn higher qualifications and the various attempts made by the School to improve the teaching capabilities of the academic staff.

The mode of instructions of the KNUST School of Mines, Tarkwa, will be assessed with the assessment criteria propounded by Castel et al (1993). Their first evaluation criterion is that the evaluation should consider the calibre of instruction, research and student achievement. The course structure and syllabi as they have gone through some

developments will also be assessed while the research will expose the dynamic nature of the courses (subjects taught).

Students' practical attachment programmes also have a lot to do with the nature of programmes run by the school. This tallies well as part of what Castel et al (1993) refer to as the calibre of instruction. The changes and methods of students' practical attachment programmes will be analysed and their impact on the teaching programmes observed as a major contribution towards the teaching functions of the School.

Under students' achievement, an analysis will focus on students' examination results. This method of assessment ties in with the first of the four evaluation methods of Ransom et al (1993) called 'direct measurement' which is concerned with evaluation of student achievement tests and performance observations.

For evaluation to be effective, assessment should not focus solely on results, outcomes or impacts. The contributions of the inputs are very germain. On that score the availability and access to the use of facilities will be carefully analysed. These include classrooms, laboratory facilities and equipment for student training, thus conforming to the quantitative indicators of Ransom et al which provide a strand through inputs, processes and outcomes.

One major policy objective of the reforms to the tertiary education system was to provide for greater access to tertiary education for qualified people and significantly increase the proportion of women students. The research will focus also on increases in student enrolment and the number of graduates over the years as a measure of evaluation of the performance of the School.

As part of the evaluation criteria the researcher will make an age profile analysis of the lecturers at the School. The essence, as noted by Addae Mensah (1999), will be to evaluate the efficiency (effectiveness) aspects of teaching. Not only will the sufficiency criteria (increased numbers of teaching staff as enrolment increased) be considered as an issue but the effectiveness aspect of the teaching function will be focused on as an issue of equal importance to evaluate the performance of the School.

For most institutions of higher learning, research is the next most important function after teaching. It is not only the quality of graduates turned out which matters. The number and quality of research carried out determine the institution's impact on the labour market and economic development as a whole. In reality the level and frequency of promotion of academic staff in most higher education institutions depend on the quality and the number of the research publications the staff carry out. The thesis considered the research works undertaken by the academic staff of the School as an evaluation criterion.

Higher education, particularly university systems, stand for extension (service) as a major component of their functions. The research will look at the contributions of the School to the community locally and nationally. The extension could take the form of consultancy service. Some of the staff serve in various capacities as chairmen or members of committees and render very useful services to the community. The service could also be in the form of short courses run for individuals and organisations. The School's performance in the form of extension will therefore be evaluated.

The third method of evaluation as propounded by Ransom et al will also be used in assessing the School. This will be done through the administration of a question guide on the Principal. The purpose is to seek his candid opinion as well as those of other internal assessors and compare them with the comments of an external assessor (peer) about the observations they have made about the School (The fourth evaluation criterion of Ransom et al). The views of stakeholders like heads of ministries, departments and agencies and some employers will also be sought to check on their perception about the School. Questionnaires will also be distributed to a section of the student body, the heads of departments of the School and all the lecturers. Their views will be sought about the School's achievements and the things which hinder their progress and performance as students and lecturers.

So will the comments of the top administrative staff of the University be sought. These are the Vice Chancellor, the Registrar, and the Director of the IMME, all in Kumasi.

A fifth evaluation criterion has been added up by the researcher which considers postgraduate training, gender balance and funding mechanisms, issues which have become very important in management of higher education institutions in Ghana.

Gender equity will be considered important, particularly when in some parts of the developing world (specifically Latin America and the Carribeans) female enrolment in higher education institutions have become a prominent feature of their educational prowers.

Some analysis of the School's finances for some years will be made to check on its self-sufficiency or otherwise. This is particularly important as the School has been

earmarked as one of the institutions which should be partially commercialised to realise a minimum of 30% of its financial needs by the year 2003.

It is the question of quality university education which has urged the researcher on to throw a search light on one institution of higher learning.

The evaluation criteria evolved provide a special challenge to the researcher as to how to examine the success or otherwise of the School.

CHAPTER THREE

KNUST SCHOOL OF MINES, TARKWA, IN PERSPECTIVE

3.1 Early Beginnings

In 1949, the Chamber of Mines approached the Government of Ghana about a place of instruction for the training of employees of the mines. The Government and the mines co-operated eventually and built the Tarkwa Technical Institute and classes began on 3rd November 1952 although the official opening did not take place until 7th October 1953.

The majority of the early students were apprentices drawn from the various mining companies and took sandwich courses. In order to increase student numbers craft courses were introduced in Mechanical Engineering Craft Practice and Motor Vehicle Mechanics.

Around 1957, the Chamber of Mines agreed with the Government on an introduction of a Mining Engineering programme at the Tarkwa Technical Institute. With the aid of a contribution of £25,000 from the Chamber the programme was mounted in January 1960 at the Diploma level and has continued successfully since.

In October 1963, the Mine Mechanics course was started with selected mine apprentices who had completed the sandwich courses. In January 1972 the Mine Electrician course was mounted on similar lines as the Mine Mechanics course.

The name Tarkwa Technical Institute was changed to Tarkwa School of Mines on 14th June, 1961 to give emphasis to the mining biased programmes of the School. With the exception of the Mining Engineering programme, all others were run at the sub-diploma level. The other programmes that were introduced later were Mine

Mechanical Technician, Mechanical Engineering Technician I and II, Motor Vehicle Technician I and II, Electrical Engineering Technician I and II and the Ordinary Technician Diploma.

3.2 Faculty Development and Growth

Before the School's elevation to a faculty status, it had been most difficult to recruit educated Ghanaians to enter the mines and consequently most supervisory posts in the mines were held by expatriates.

Over the past twenty five years, with assistance from the Canadian International Development Agency (CIDA), United Nations Development Programme (UNDP) and the Gessellschaft Technische Zusamearbeit (GTZ), the School has been developed to its current standard which is assessed to be high by all criteria.

A year after the School's affiliation to the Kwame Nkrumah University of Science and Technology, Kumasi, a degree programme was introduced in Mining Engineering which terminated at the level of Post-graduate Diploma. This system, a five-year programme, was adopted on the advice of the GTZ to follow the then existing practice in the Technical University of Berlin, Germany.

From 1980, departments other than the only then existing Mining Engineering Department began to emerge. In that year, a Diploma programme in Geological Engineering was introduced. In the 1985/86 academic year a Diploma programme in Mine Surveying became a new addition to give full complement of programmes to the Department of Geology and Survey.

In 1987/88 the Department of Mineral Technology which had existed only to service other departments began a new diploma programme in Mineral Technology, now

Mineral Engineering. An Applied Engineering Science Department was also servicing the others by offering Mathematical and Engineering Sciences to all other students as a component of their programmes. In 1993/94 it began to offer two new diploma programmes of its own in Mine Mechanical and Mine Electrical Engineering. In that same year it offered Technician Part III programmes in Motor Vehicle Technician, Mechanical Engineering Technician and Electrical Engineering Technician to replace the parts I and II of these programmes that had been in existence.

3.3 Current Programmes and Facilities

To achieve its mission and objective, the School is currently organised into four academic departments which offer various programmes as presented in Table 3.1

The running of any academic institution hinges around the offer of relevant programmes. The programmes as shown in table 3.1 have been the result of several changes in course structure and syllabi from sub certificate up to the doctorate level. The metamorphosis will continue until the entire City and Guilds (sub diploma) programmes would be phased out at the end of the 2000/2001 academic year.

Similarly as the School develops towards the status of a University College less emphasis will be placed on non degree programmes. For that reason no fresh students were admitted during the 2000/2001 academic year into any diploma programme. Instead all fresh students were admitted for degrees except one certificate programme which is being run purely as an income generating venture.

Table 3.1 **Departments and Programmes at KNUSTSM, Tarkwa**

	Department	Programmes
1	Mining Engineering	Certificate in Mining Engineering Diploma in Mining Engineering BSc in Mining Engineering Pg. D in Mining Engineering MSc/MPhil in Mining Engineering PhD in Mining Engineering
2	Geology & Survey	Certificate in Drilling Diploma in Geological Engineering Diploma in Mine Surveying BSc in Mining Geology BSc in Mine Surveying
3	Mineral Technology	Diploma in Mineral Engineering BSc in Mineral Engineering
4	Applied Engineering Science	City & Guilds Certificate in General Mine Mechanics City & Guilds Certificate in General Mine Electrician City & Guilds Certificate in Mine Mechanical Technician Diploma in Mine Mechanical Engineering Diploma in Mine Electrical Engineering BSc in Mine Mechanical Engineering BSc in Mine Electrical Engineering

Source: Existing Structure and Organisation of the School

The running of programmes by faculties in higher education institutions also depends on facilities for teaching and learning. Right from some humble beginnings the School has slowly but steadily developed facilities to offer tertiary level instructions to its students. Table 3.2 shows the major facilities which are currently at the disposal of both lecturers and students which aid teaching and learning.

Out of an estimated 15,000 volumes of books needed for the library, there are currently 12,653 volumes available with thirty-six periodicals and forty-seven journal titles. The current library occupies a very small space.

Table 3.2 **Facilities Available for Teaching and Learning**

Number	Facilities
13	Classrooms (Undergraduate programmes)
1	Classroom (Postgraduate programmes)
1	Mineral Processing laboratory
1	Mechanical Engineering laboratory
1	Electrical Engineering laboratory
1	Electrical Workshop
1	Rock Mechanics laboratory
1	Soil Mechanics laboratory
1	Mine Environmental Engineering laboratory
1	Survey Room
1	Engineering Drawing Room
1	Computer laboratory with Internet café
1	Library (small size and seating capacity)
1	Reading Room

Source: Field Data

As the School plans to become a University College, the administration is expanding facilities with the meagre resources at its disposal. Currently the two old hostel facilities are being turned into lecture theatres, laboratories and offices to aid teaching because the ever increasing problem of large numbers of applicants in relation to the admission offers continue to mount as the years go by.

The former gold refinery building put up under the President Nkrumah administration but which never become operative has now been handed over to the School by the Ministry of Mines and Energy. This is gradually being developed into a student hostel. A new Junior Common Room (JCR) building is also being put up as an

adjoining structure to the main student hostel with the view that the current JCR will be added up as a lecture theatre.

The emphasis, in line with government policy, is to increase intake of students as long as there are enough lecture rooms and theatres to facilitate teaching. Table 3.3 shows the number of applications received and the actual numbers admitted into the KNUST School of Mines, Tarkwa (Undergraduate, Diploma and sub diploma programmes between 1989 and 1999.

Table 3.3 **Figures showing applications received and the actual numbers admitted at KNUST School of Mines, Tarkwa, 1989 – 1999**

Year	No. Applied	No. Admitted	% of Applicants Admitted
1989	528	205	38.8
1990	452	200	44.2
1991	658	239	36.3
1992	603	240	39.8
1993	621	227	36.5
1994	811	250	30.8
1995*			
1996	510	199	39.0
1997	557	224	40.2
1998	544	225	41.3
1999	537	229	42.6

* No admissions due to closure of universities in Ghana

Source: Admissions Office, KNUST School of Mines, Tarkwa,

The statistics in table 3.3 shows that not even 45% of the applicants for any particular year gain admission into this School. The situation is worse in some other universities in the country. This has cost implications for the School and the nation as a whole.

The Government White Paper on the Reforms to the Tertiary Education System (1990) attributes the high cost of tertiary education in Ghana, especially those of universities, in part, to the small size of enrolments. Small size institutions, according to the White Paper, can hardly enjoy the known economies of scale which exists in the provision of tertiary education.

The Paper further notes that unit costs are inflated by the failure to make maximum use of the very expensive teaching and research personnel and physical facilities. Generally, teaching takes place for only 26 weeks in the year and sandwich courses or full time vacation training programmes are not conducted. Furthermore, facility utilisation during term time is estimated at only 50% on average.

3.4 Teaching Staff Position

At the beginning of the tertiary programmes in the School in 1977 almost all the teaching staff for the tertiary programmes were expatriates mostly from Germany. There existed, however, Ghanaian instructors who, before then, were handling the sandwich and Craft Practice courses. The few lecturers who were recruited after 1979 were sourced from the mining industry most of whom were the Eastern trained personnel who were practising as Mining Engineers. Almost all of them had to undertake intensive training as counterpart lecturers to other colleagues form the Technical University of Berlin.

With the assistance of the School, many of the lecturers undertook further studies. The course structure and syllabi changed with time, and with the introduction of other mining related disciplines, the School can now boast of lecturers not only in Mining Engineering, but also in Geological Engineering, Mine Surveying, Mineral Processing

and Materials Engineering, Mine Mechanical and Mine Electrical Engineering. Table 3.4 shows the distribution of instructors who teach tertiary programmes in the various departments in the School.

Table 3.4 **Number of Lecturers at Post at KNUST School of Mines, Tarkwa.**

Department	Professors	Senior Lecturers	Lecturers	Shortfall
Mining Engineering	2	5	4	
Geology/Survey	-		8	4
Mineral Technology		-	4	2
Applied Engineering Science	-	1	10	4
Total	**2**	**6**	**26**	**10**

Source: Field Data

Inspite of the fact that all the lecturers are now Ghanaian, the School does not have the full complement of its academic staff which should be 44. This is attributable to a number of reasons. Some of the instructors who undertake further training outside the country refuse to return home. There are those who also travel outside the country on sabbatical leave but who do not return to the country and to the School.

The shortfall in the number of lecturers required by the School is by no means small and this is replicated in much larger proportions in all universities in Ghana.

A clearer picture of the paucity of the teaching staff situation in Ghanaian universities can be painted using the situation at the Kwame Nkrumah University of Science and Technology (KNUST) of which the School of Mines at Tarkwa is a faculty.

In the 1961/62 academic year the total student population of the university was 708. The teaching staff numbered 94 with a student-teacher ratio (STR) of about 8 : 1

(Basic Statistics, 2000). In the 1999/2000 academic year the number of students rose to 9,501, an increase of approximately 1300%. There were, however, only 478 lecturers (and of these a mere 17% were below age 40) giving an average student-teacher ratio of 20 : 1. This could be understood in the following context. In 1995, the universities of Ghana were compelled by government to adopt a student : teacher ratio of 12 : 1 on the average for the various faculties. The situation as existed at KNUST in the 1999/2000 academic year is illustrated in table 3.5.

Table 3.5 **Teaching Staff Position at KNUST during the 1999/2000 academic year**

Faculty	No. of Students	Mandatory STR	Senior Members	
			At Post	Required
Agriculture	678	12 : 1	34	52
Art	1067	12 : 1	45	51
Engineering	1389	12 : 1	79	121
Environmental & Development Studies	848	12 : 1	43	65
Medical Sciences	633	8 : 1	65	90
Pharmacy	418	10 : 1	25	40
Institute of Land Management & Development	365	12 : 1	13	24
School of Mines (Kumasi)	334	12 : 1	17	19
School of Mines (Tarkwa)	524*	12 : 1	30	40
Institute of Renewable Natural Resources	449	12 : 1	23	32
Social Sciences	1044	18 : 1	38	79
Science	1752	12 : 1	63	168

* - Faculty Students only

Source: Basic Statistics, Planning Unit, KNUST

Under the current norms, the Faculty of Science required 168 lecturers but had only 63. Each lecturer was forced to carry almost three times (30 students instead of 12) the normal load. A lecturer in any faculty is required to serve as an academic tutor, supervise several final year student projects and work well into the night marking

scripts, advising students and serve on various committees of the University. The School of Engineering required 121 lecturers but had to make do with 79.

The story can be retold for all other faculties and for the other universities. The University College of Education at Winneba, for example, had at the time a total academic staff requirement of 448 but a paltry 192 were at post. (Osei, 2000)

With a shortfall of ten lecturers for the School of Mines, Tarkwa, it might appear that the situation there is much better than what pertains in many faculties of the KNUST. It has, however, taken the authorities well over five years to source only two lecturers for one department.

The reasons why it is difficult to attract the most brainy graduates to lecture and lecturers at post do not return home after further studies and sabbatical leave are not too difficult to unearth. Universities train the future manpower needs of a country. The Government has not made it possible for the Universities to attract competent lecturers and even maintain qualified lecturers. Lecturers are poorly paid. Consequently the professor, who trains the engineer, the medical doctor, the accountant and other professionals, earns only a fraction of their salaries within a few years of their graduation. However, it takes an average of twenty years for a lecturer to become an Associate Professor in a Ghanaian university. The salary differences between the newly trained mining engineers and their professors are much more higher than the general situation described.

Commenting on this situation, Osei (2000) quotes Josiah-Aryeh and notes that "many university dons live in lordly poverty and in the end expect little financial recompense for years of service to the nation." The Committee of Vice Chancellors and Principals

(CVCP) re-echoed the same position when they noted that "universities are local as well as international institutions. They belong to a world-wide community of scholars. Therefore their conditions of service should be internationally competitive so as to attract staff both local and international, with the requisite training and qualifications if standards are to be maintained. Any university that is unable to maintain the required level of excellence will lose its international recognition and by implication, cease to be a University." (CVCP, 1998).

3.5 Administration of the KNUST School of Mines, Tarkwa.

Under the current administrative structure of the Institute of Mining and Mineral Engineering (IMME) the School of Mines at Tarkwa is one arm of the Institute with the School of Mines, Kumasi as the other arm. There is some level of autonomy of the two Schools. The two Schools are of equal status and are each accorded the statutory status of a faculty. They each receive a separate direct subvention from the government (KNUST, 1983).

The School of Mines at Tarkwa has responsibility for:

i. preparing applications for admission to programmes and courses offered by the School at Tarkwa.

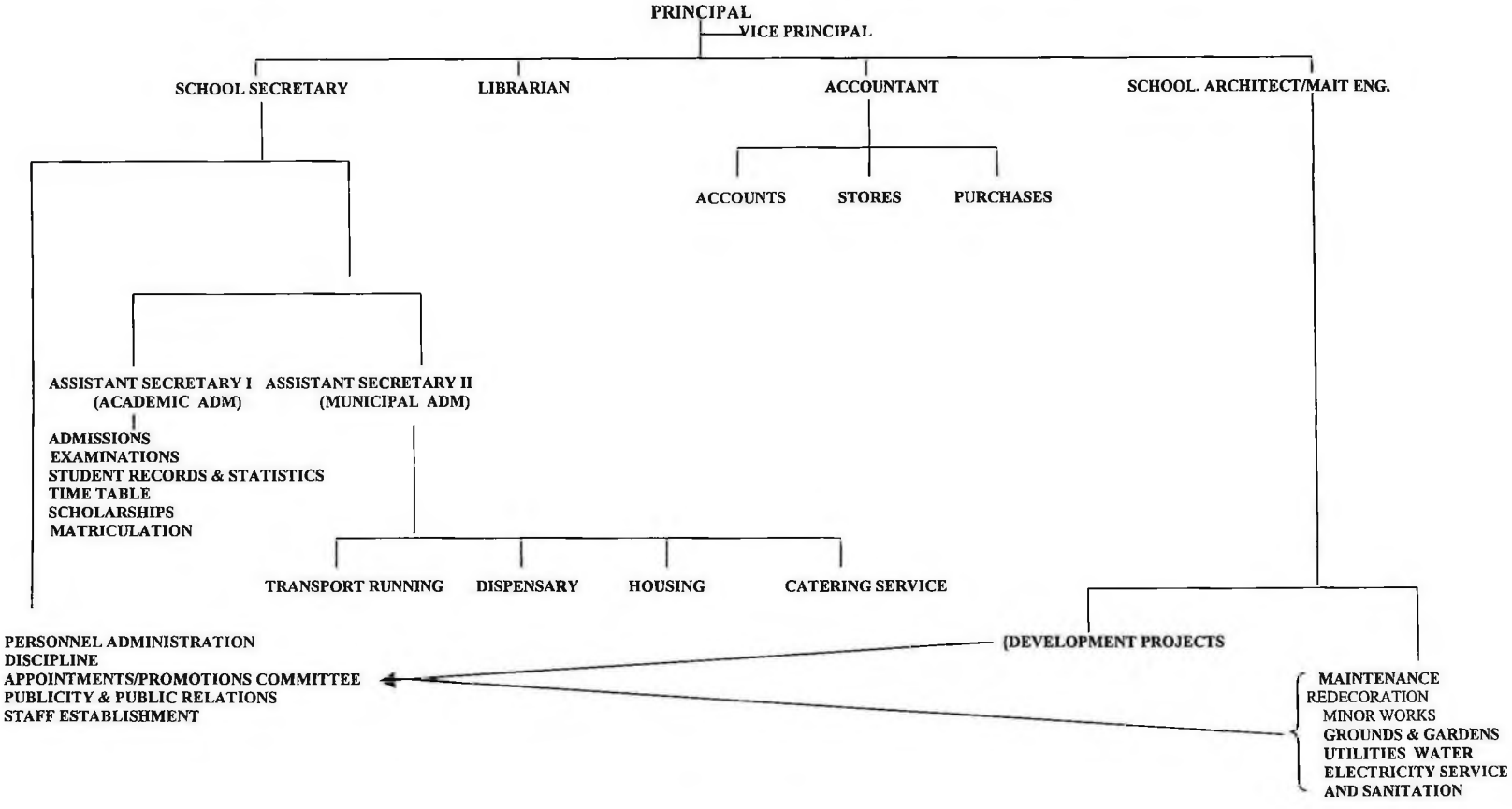
ii. the physical arrangements for the conduct of examinations at the School at Tarkwa.

iii. processing of applications and conduct of interviews for appointment of staff excluding appointment to senior member positions, which will continue to be the responsibility of the University Appointments and Promotions Committee.

iv. the administration of the campus at Tarkwa.

Figure 3.1 shows the Organogram (Organisational Chart) of the KNUST School of Mines, Tarkwa

Fig. 3.1 ORGANISATION CHART OF KNUST SCHOOL OF MINES, TARKWA



3.5.1 Principal

The Principal who has the overall control of the School and, is subject to the Vice Chancellor (VC) and the Statues of the University, is the administrative, executive and disciplinary officer of the School. He has the right to advise the School Board and through it to the Academic Board and the University Council on all matters affecting policy, finance, government and administration of the School. The Principal is appointed by the University Council on the recommendation of the Academic Board.

3.5.2 Vice Principal

The Vice Principal is elected by members of convocation in the School in the same way as the Pro Vice Chancellor. The eligible candidates who are nominated by the Principal are either of professorial status or Heads of Academic Departments. The nominees are usually three in number. The Vice Principal assists the Principal and performs such specific duties as the Principal may delegate or assign to him.

3.5.3 School Secretary

There is a School Secretary who assists the Principal in the day to day running of the School. He provides the secretarial services required for the efficient and effective operations of all statutory school committees. He is assisted by a number of staff of both senior member and senior staff status which are determined from time to time. His status is that of an Assistant/Senior Assistant/Deputy Registrar.

3.5.4 School Accountant

The School Accountant is responsible, under the Principal, and in liaison with the other principal administrative professional scheduled officers, for preparation of the School's annual estimates. He is required to maintain proper records of the School's financial transactions. He prepares the annual accounts for audit and has control over

the School's stores and purchasing transactions. He is assisted by such number of professionally qualified staff and other staff as are determined from time to time.

3.5.5 Maintenance Engineer

The School's organogram has provision for either an Architect or a Maintenance Engineer who liaises with the University's Director of Works and Physical Development and supervises all physical projects in the School. In addition, the Maintenance Engineer, the position that the School has now filled, is responsible for the planning and execution of minor works, the maintenance of the School's buildings, records and physical planning, including the provision, distribution and maintenance of utilities – water and sewerage, electricity, grounds and the gardens.

3.5.6 School Librarian

The organisational chart provides for a School Librarian who should be professionally qualified. The Librarian is responsible for the development, maintenance and provision of an efficient and effective library service in the School. Currently the position is occupied by a Chief Library Assistant.

3.6 Boards and Committees

The University, and for that matter the School is effectively run under Boards and Committee systems. A number of such committees have been institutionalised in the School for smooth administration.

3.6.1 School Board

The University makes provision for a School Board at Tarkwa in the same way as provided for each faculty, School or College. (KNUST, 1983) The School Board has power under the Academic Board:

i. to regulate within the general policy approved by the Academic Board, the teaching and study of the subjects assigned to the School.

ii. to recommend the provision of adequate instruction and facilities for research in the disciplines assigned to the School.

iii. to recommend the appointment of Internal and External Examiners.

iv. to advise on regulations and syllabuses dealing with courses of study for degrees and other distinctions of the School.

v. to make recommendations for the award of degrees, diplomas, certificates and university fellowships, studentships, scholarships and prizes within the School.

vi. to consider School budget and allocations to departments.

vii. to deal with any matters referred or delegated to it by the Academic Board.

The School Board is required to meet at least twice a semester and could hold emergency and special meetings as provided for in the Statute.

3.6.2 **Departmental Boards**

Each department in the School has a Departmental Board which comprises all senior members, meetings of which are convened at least twice every semester. The Departmental Board meets:

i. to consider general organisation and regulation of courses and research.

ii. to co-operate with the School Board in all matters affecting the Departments in the School.

3.6.3 Headship of Departments

Each of the four departments in the school has an appointed head who preferably should be of professorial status. Where there is no professor, the headship of the department is appointed from the next lower rank. The Head is appointed by Council through the Academic Board on the recommendation of the Principal. A choice is normally made from one of the three most senior members in the Department.

The Head of Department, with the approval of the School Board:

i. organises the teaching programmes, maintains acceptable standards of teaching and ensures that facilities are available for research in the respective disciplines.

ii. recommends to the School Board, in consultation with the members of the department, the development of syllabuses and courses as well as promotes research in the Department.

iii. administers the department, recommends for the appointment and promotion of staff and for the maintenance of discipline.

iv. liases with other schools, industries, professional institutions, associations and similar bodies on matters which affect his department

v. consults with the Head of the School in all matters which affect his department and the School.

3.6.4 Membership of the Academic Board

The Principal, the Heads of the Academic Departments and the senior members of professorial rank in the School are members of the University Academic Board. In addition one member, not below the rank of a lecturer elected from the School by the School Board, is a member and attends Academic Board meetings in Kumasi.

3.6.5 Other Boards and Committees

In addition to the School Board and the Departmental Boards, statute 17 provides for the constitution of other boards and committees to facilitate and strengthen the management and administration of the School as follows:

i. Appointments and Promotion Committee
   (Senior and Junior Staff)
ii. Domestic Services Committee
iii. Estate Management Committee
iv. Library Services Committee
v. Residence Committee

There are a number of on going development projects in the School. In addition the School runs municipal and security services for its maintenance and provides some welfare services to its employees. These include a clinic, basic schools (that is Nursery, Primary and Junior Secondary Schools) and maintenance and estate sections. Focus on academic progress has also been sharpened. These developments have necessitated the establishment of some other equally important committees as listed below:

i. Development and Projects Committee
ii. Computer Services Management Committee
iii. Scholarships Award Committee
iv. Primary/JSS Management Committee
v. Health Services Management Committee

The membership of the School Board and the various committees of the School are as found in appendix 2.

3.7 Funding Mechanism

One major difficulty that faces most Ghanaian and African universities is that of dwindling resources, particularly funding. The extent to which the financial requirements of the universities are met is a sine-qua-non to the achievement of their aims and objectives.

Even though the philosophy on which most African universities was founded was that of autonomy, that is to become self-governing societies, the idea seemed unrealistic for two reasons. First, African Universities did not have any previous experience with Western style universities from whose models they copied. Secondly the economic dependence of these higher institutions on the governments, the funding bodies, was not in consonance to the idea of independence of action (Ashby, 1964).

The School of Mines, Tarkwa, as a part of the KNUST, relies almost entirely on government subvention for its upkeep. Unfortunately, however, it has become almost chronic that not all the annual budgeted financial requirements of the universities are granted them in any particular year. The School of Mines, Tarkwa in a spate of only five months in 1999 (January – May) had a short fall of ¢660,141,263.14, which is 48.71% short of the actual amount of ¢1,355,274,786.63 required for the same period. This had been communicated to the Minister of Education since it was rendering the administration of the School almost impossible. (see copy of letter in Appendix 3).

At a time when the government had just moved away from the Programme Linked Budgeting System (PLBS) to the Medium Term Expenditure Framework (MTEF)

Budgeting System, government was withdrawing more funding from the universities. Table 3.6 shows the total recurrent expenditure on three universities, (University of Ghana, Kwame Nkrumah University of Science and Technology, and University of Cape Coast) as against the actual amount budgeted for in a five year period.

Table 3.6 **Recurrent Expenditure on the first three universities in Ghana (1990 – 1994)**

Year	Budgeted Amount (¢ millions)	Actual Amount Granted (¢ millions)	Actual/Budgeted (%)
1990	9,620.71	6,240.46	64.87
1991	10,564.80	7,888.13	74.66
1992	12,787.48	10,289.06	80.46
1993	18,968.22	13,627.43	71.84
1994	20,206.93	15,717.07	75.70

Source: Ministry of Education Report on Funding of Tertiary Education in Ghana, 1996

In another instance Deheer-Amissah (1997) gives figures for all five publicly funded universities , (University of Ghana, Kwame Nkrumah University of Science and Technology, University of Cape Coast, University College of Education, Winneba and University of Development Studies) for a two year period as indicated in table 3.7

Table 3.7 **Funding for the Five Public Universities in Ghana (1996 – 1997)**

Year	Amount Required (¢ millions)	Amount Granted (¢ millions)	% of Amount Required/Amount Granted
1996	60,045.35	44,245.59	73.70
1997	77,257.68	47,524.66	61.50

Source: Deheer-Amissah in a paper presented at a national forum on funding of Tertiary Education, January 27,1997.

Even though it is usual for government not to honour all the required amounts to fund the publicly owned universities, the shortfall for School of Mines, Tarkwa, has been much higher than is usually expected.

Lockwood and Davis (1985) have noted that the financial constraint which face the university reflects the state of the national economy, an observation which appears to be relevant to many countries where university education is funded almost entirely by the government, most particularly in the developing countries.

Quoting a former president of the University of Chicago, Hutchins (1993) indicates that "hard times are producing nothing less that a complete change in character of our institutions of higher education. Every aspect of their work is being affected. Their faculty, their students, their organisation and their methods, their teaching and their research are experiencing such alteration that we who know them in the good old days shall shortly be unable to recognise them."

Lockwood and Davis again contend that the pressure and changes that the universities are facing have major challenge for those who are charged with the task of managing them.

For School of Mines, Tarkwa, what has provided the cushioning effect to the budgetary shortfalls are the aid projects and programmes which have been associated with the institution. The CIDA was followed by the UNDP and then the GTZ with which it has associated the longest.

The GTZ has, for almost two decades, supplied books, equipment and vehicles to the School and assistance to lecturers to attend international conferences, seminars and educational trips. This project has assisted three lecturers to obtain doctorate degrees

through sandwich programmes with the Technical University of Berlin in Germany. One other has had an M.Phil degree through the same arrangement.

The task of the university administrator, particularly in developing countries, is about how to manage the current difficulties which face the university. To be able to do this at KNUST School of Mines, Tarkwa, it is pertinent to assess its performance over the years that it has existed as a tertiary institution. It is through the identification of the weaknesses and the threats which face it that the strengths and the opportunities ahead of it can be unearthed. This constitutes the task for the fourth chapter.

CHAPTER FOUR

EVALUATION OF KNUST SCHOOL OF MINES, TARKWA

4.0 Introduction

This chapter is devoted to a detailed analysis of the data gathered for the research. Out of 120 questionnaires sent out, representing about 20% of the current student population, the number properly completed and returned was 103. Seventeen were either not returned or rejected by the researcher on the basis of non completion or poor responses. There are 34 academic staff at post, four of whom double up as heads of departments and one as the Principal who were interviewed separately. Five of them are on study leave. The remaining 24 lecturers were supplied with questionnaires out of whom 19 completed and returned them for processing. Three top administrators of the University were interviewed. These were the Pro Vice Chancellor, representing the Vice Chancellor, the Registrar and the Director of the Institute of Mining and Mineral Engineering all in Kumasi. Eleven heads of departments and agencies in the Wassa West District most of whom are alumni of the School were also interviewed.

In this research, the assessment criteria employed to evaluate the KNUSTSM, Tarkwa, as suggested in the third chapter can be summarised under the four main methods of evaluation of higher education institutions propounded by Ransom, Khoo and Selvaratnam (1993). The first method, called the Direct Method, evaluates students' achievement tests and observations of their academic performance (usually through examination results). The second method, called Quantitative Indicators, links inputs, processes and outcomes. The third evaluation criterion is through statements made by those directly involved in the institution being evaluated, in this case the students, lecturers, heads of academic departments and the top university

administrators. The fourth system of assessment is through the external experts or peers, in this instance the comments of other stakeholders reflected in the various questionnaires administered (appendix 1). The researcher added up a fifth evaluation method, dubbed other evaluation criteria.

4.1 Students' Achievement Tests and Performance

After the KNUSTSM, Tarkwa, became affiliated to the main university, attention was directed more towards tertiary (university approved) programmes. Even though non-technician programmes were introduced after 1976, they were higher level technician programmes which replaced the lower level ones. An assessment of the School's examination results for the last eighteen years (degree, diploma and certificate programmes) point to the fact that a lot of attention has now been turned towards the tertiary programmes.

Table 4.1 shows figures on the number of degree students of the School who passed their final examinations at their first sitting. It also shows the various classes obtained and the number that trailed a course or the other. Students who trailed courses eventually cleared them after the resit examinations.

The total number and percentage passes of the degree students reveal a generally high performance level over the years. The average (percentage) pass mark of all degree students over the years which is 87.10 is, by all standards, high. The results also show that throughout the years a greater percentage of the degree students obtained better classes (2^{nd} Upper or better) and in no one year has less than 66% of the degree students passed. The percentage passes were, however, higher (100%) within the first

five years of the programme even though the first class results appeared very much later.

Table 4.1 **Examination Results of Degree Candidates KNUSTSM, Tarkwa, 1982-2000**

Year	No. in Class	1st Class	2nd Upper	2nd Lower	Pass	No. Trailed	Total No Passed	% Passes
1981/82	4		3	1			4	100
1982/83	12		7	5			12	100
1983/84	5		1	4			5	100
1984/85	8		4	3	1		8	100
1985/86	5		2	3			5	100
1986/87	4		1	2		1	3	75
1987/88	6		3	3			6	100
1988/89	8		5	2		1	7	87.5
1989/90	3		1	1		1	2	66.7
1990/91	5		4	1			5	100
1991/92	11		5	3		3	8	72.73
1992/93	12		7	5			12	100
1993/94	13	1	7	3		2	11	84.62
1994/95*								
1995/96	20	1	14	4		1	19	95.00
1996/97	28	3	12	4		9	19	67.86
1997/98	13	4	5	3	1		13	100
1998/99	26	2	11	7		6	20	76.92
1999/00	26		15	8		3	23	88.46
TOTAL	209	11	107	62	2	27	182	
% of total Passes	100	5.26	51.20	29.67	0.97	12.92	87.10	87.10**

* No graduation due to closure of universities in Ghana.

** Weighted % passes

Source: Academic and Student Affairs Office, KNUSTSM, Tarkwa

From the 1993/94 academic year onwards the School began to register first class results, thus brightening up its image at the Academic Board.

Table 4.2 shows a picture of the examination results at the Diploma level

Table 4.2 **Examination Results of Diploma Candidates, KNUSTSM, Tarkwa, 1982-2000**

Year	No. in Class	Distinction	Pass	No. Trailed	Total No Passed	% Passes
1981/82	11		11		11	100
1982/83	12		12		12	100
1983/84	18		18		18	100
1984/85	17	3	14		17	100
1985/86	18		18		18	100
1986/87	17		17		17	100
1987/88	14		9	5	9	64.29
1988/89	12		9	3	9	75.00
1989/90	24		23	1	23	95.83
1990/91	19		9	10	9	47.37
1991/92	30		25	5	25	83.33
1992/93	24		21	3	21	87.50
1993/94	41		25	16	25	60.98
1994/95*						
1995/96	51		24	27	24	47.10
1996/97	58	2	31	25	33	56.90
1997/98	65	1	39	25	40	61.54
1998/99	92	4	57	31	61	66.30
1999/00	105	2	50	53	52	49.52
TOTAL	628	12	412	204	424	
% of Total Passes	100	19.11	65.61	32.48	67.52	67.52**

* No graduation due to closure of universities in Ghana.

** Weighted % passes

Source: Academic and Student Affairs Office, KNUSTSM, Tarkwa

Majority of the candidates passed all the various courses. The results of the last six years were not as good as those of the first six years with the 1995/96 results being the poorest of them all. From the 1996/97 academic year a number of distinctions were registered after the initial three which were registered as far back as the 1984/85 academic year.

The weighted average percentage passes of all the Diploma candidates over the years is 67.52. It is clear that even though this is high, it is not as impressive as the degree and certificate results. The certificate results are as shown in table 4.3.

Table 4.3 **Examination Results of Certificate Candidates, KNUSTSM, Tarkwa, 1983-1993**

Year	No. in Class	Distinction	Pass	No. Trailed	Total No Passed	% Passes
1982/83	6		6		6	100
1983/84	7		78		7	100
1984/85	7	1	6		7	100
1985/86	6		6		6	100
1986/87	3	1	2		3	100
1987/88	10		4	6	4	40
1988/89	8	3	3	2	6	75
1989/90	8		8		9	100
1990/91	8	2	5	1	7	87.5
1991/92	14	2	8	1	10	71.43
1992/93	9	2	7		9	100
TOTAL	86	11	62	13	74	
% of Total Passes	100	12.79	72.09	15.12	86.05	84.88*

- Weighted % passes

Source: Academic and Student Affairs Office, KNUSTSM, Tarkwa

The results of the certificate candidates are also impressive. They are almost as good as the degree results. The weighted average percentage of the passes is 84.88 and 86.05 of the candidates passed their examinations at the first sitting.

The running of the certificate programme in Mining Engineering ceased when the School was unable to have the minimum number of applicants with the right entry requirements.

It may be noted that the results of the diploma candidates, even though high, are not as impressive as those of their degree counterparts. The reasons for the discrepancy are twofold. The first reason stems from the fact that the entry requirements at the

degree level is much more competitive than at the diploma level. The second is that inspite of the differences in entry requirements there is only a thin line that lies between the degree and the diploma programmes regarding content and depth of knowledge taught and learnt.

In the 1980s the diploma students spent one full year on the mine whereas the undergraduates spent one semester on practical attachment. It may be noted also that until the School adopted the current course structure and syllabi, diploma students were taking more courses than their degree counterparts. Again both groups of students presented supervised thesis (project work) and defended them. Diploma programmes run on the other university campuses in the country do not require supervised thesis work.

The academic performance expected of both diploma and degree students are high. However the academic background of the two groups of students are different. The natural result is that the degree students will perform better.

With such high expectation of the level of performance from all students, it is not surprising that the diploma products perform as well in the field as their degree counterparts. The diploma products of the School occupy not only middle level positions in the mining and allied institutions but also some of the top and managerial positions in the industry. Whereas a graduate of the School is currently the General Mine Manager of Ashanti Goldfields (Ayamfuri mine), two diplomats head the Precious Minerals Marketing Corporation, Tarkwa branch. Many of such examples are replicate in the industry. Therefore, by the criterion of students achievement test and performance, it can be deduced that the School has so far performed well.

4.2 Quantitative Indicators

The second assessment criterion, called Quantitative Indicators, has a direct relationship with the first which is Students' Achievement Tests and Performance. In other words the quality of students trained (the outcomes) depends on the inputs (facilities) and the processes (methods of training).

On that score the inputs refer to the courses pursued, the facilities available for instructions which are in the form of classrooms, laboratories and the equipment, lecture materials in the form of notes, overhead projectors and the like. The processes, on the other hand, refer to the instructional techniques and attachment programmes available to students. The quality of the teaching staff is also important for the process because it has something to do with their level of qualification and their knowledge of the methods of teaching. Age profile analysis also determines the quality of instruction and sustainability of the programmes.

4.2.1 Relevance of Programmes

The programmes of the School at both the diploma and degree levels have gone through some transformation in line with changing circumstances and as dictated by dynamism in knowledge.

At the inception of the Diploma programmes, students were previously attached to various mining companies for one full year to gain practical knowledge in mining. This was followed by a four semester classroom work which were also interspersed with vacation attachment training. As student numbers grew and placement for attachment became narrower the programme was redesigned such that the one year attachment was shortened to one semester with a four-semester classroom work.

The degree level began with a system in which during the first year, the first semester was devoted to classroom work and the second semester to practical attachment at the mine. The remaining six semesters were for classroom work which were also interspersed with vacation attachment programmes. After the fourth year the programme was continued with a one-year post-graduate diploma programme in Mining Engineering. Even though the one year programme was not compulsory most students pursued it.

In the 1995/96 academic year completely new course structures and syllabi were adopted to reflect the changing needs of the society. This was the year in which the Senior Secondary School graduates entered the Universities and other tertiary institutions in the country.

The new course structure made the diploma programmes three years and the degree four years, thus scraping the one year post-graduate diploma programme, and filling in the one semester and one year practical attachment periods with relevant courses. These have given way to vacation programmes which carry credits.

These developments have become necessary because student numbers are such that it is becoming increasingly difficult for the companies to contain all students of the School for practical training. Moreover the mining companies train students not only from the School but from other tertiary institutions as well. Not only do they find the large numbers of students an interruption to production but also a serious financial drain because the students on attachment are paid some allowances by the companies.

In order to enrich the new programmes and to make the new graduate broad minded, general study courses have been added up. These are:

Communication Skills

Law of Contract and Torts

Public Relations

Economic Development Planning

Business Entrepreneurship

On the relevance of the School's programmes, the lecturers' questionnaire sought to find out the importance of the various departmental programmes to the job market. A similar question to the students was to ascertain how their programmes would impact on their future careers. Table 4.4 indicates the responses as were provided by both lecturers and students.

Table 4.4 **The Relevance of the School's Programmes to the Industry**

Respondents	Very Relevant	Relevant	Uncertain	No Response	Total
Students	54 (52.43%)	24 (23.30%)	7 (6.80%)	18 (17.48%)	103
Lecturers	18 (94.74%)	1 (5.26%)	-		19

Source: Computed from Questionnaire

Out of a total of 103 students, 54, representing 52.43% saw their programmes as being extremely relevant to their aspirations and therefore their future career. 24 of them (23.30%) saw them as just relevant with only 7 (6.80%) who were either uncertain or did not relate their programmes to their future careers. 18 (17.48%) did not respond to the question.

In the case of the lecturers, 18 out of the 19 respondents (94.74%) appreciated the relevance of the School programmes to the industry. The remaining one saw the programmes as just relevant.

The majority of the student respondents, among other things, related the relevance of their programmes to the way in which such programmes have been enriched with the General Study Programmes. The students' responses in this direction are as found in table 4.5

Table 4.5 **Relevance of General Study Programmes**

Relevant	69 (66.99%)
Not Relevant	6 (5.82%)
No Response	28 (27.18%)
Total	103

Source: Computed from Questionnaires

Even though 28 students (27.18%) have not appreciated the rationale for the introduction of such 'foreign courses' into their programmes and, therefore, did not respond to the question, as many as 69 of them (66.99%) do really praise the School authorities and admit that it is a laudable idea to make them that broadminded. They appreciate that different subject areas are only a compartmentalisation of one broad stem of knowledge. Only 6 students (5.82%) do not in anyway see the relevance of being made versatile. Perhaps this should not be surprising since two students offering Mining Engineering do not appreciate the importance of Mathematical Analysis and some of the Applied Science Courses.

4.2.2 Employment Opportunities

One test case to indicate the relevance of a programme is to ascertain the extent to which the beneficiaries of the programme secure employment. Until the late 1990s when the mining industry was seriously affected by world market events, which have

made a number of the companies shrink in activities, products of the School were easily employed. In fact they got jobs faster than was usually anticipated.

Most of the School's graduates skipped national service because jobs were literally waiting for them. Sometimes employers went to source out final year students during the thesis defence time for employment. The lecturers through whom most of the graduates were recruited made a confirmation of this fact. This is evidenced from table 4.6 which gives answers to the question "How easy has it been for the former students (from your department) to acquire jobs after schooling?"

The responses indicate that it used to be very easy for products of the School to get employed before the late 1990s but now the opportunities are not as bright for a number of reasons. The absorptive capacity of the industry has been overstretched. That means a lot more products have been trained than can be fully employed by the mining establishments. Some of the companies keep folding up as world prices of the minerals keep falling, thus, are unable to expand their productive capacity and employ more staff. The companies which have remained have abandoned the underground mines which have longer life span and maintain labour for longer periods.

The extensive use of machinery in this age of mechanisation does not call for the use of extensive labour as was previously the case.

Table 4.6 **Students' Chances of Securing Employment**

Lecturers' Views	Before Late 1990s	After Late 1990s
Very Easy	10 (52.63%)	-
Easy	6 (31.58%)	2 (10.53%)
Not Very Easy	3 (15.79%)	15 (78.94%)
Not Easy at All	-	2 (10.53%)
Total	19 (100%)	19 (100%)

Source: Computed from Questionnaire

4.2.3 Inputs for Teaching and Learning

If by the Students" Achievement Tests and Performance the products of the School have stood the test of time and that a great number have been engaged by industry, then it means that it takes a lot of time and money, to train such good products. The important inputs for this task have been the availability of classrooms, laboratories and equipment, library and teaching aids, the methods of teaching and quality of the lecturers.

4.2.3.1 Classrooms

The School in its physical development has always had classroom space as one of its core objectives. Two floors of a block which were used to accommodate the few female students and some national service personnel have been converted into classrooms. The female students have joined their male colleagues in the main hostel. With the stoppage of diploma and sub diploma programmes four additional classrooms have now been created bringing the total to thirteen.

4.2.3.2 Laboratories And Equipment

With respect to laboratories and equipment, the lecturers seem to be working under very trying conditions. The problem has been echoed by the students and the Heads of the Academic Departments. Among the difficulties commented upon were that the equipment in some of the laboratories are insufficient compared to student numbers. Access is therefore a big problem especially outside normal lessons when students could experiment on their own.

The lecturers blamed the students for poor handling of equipment when left on their own. This is attributable to lack of enough laboratory technicians to assist students to do independent work.

The other problem is that some of the equipment are obsolete and are hardly well maintained. The responses of the students on these issues were that only 10 of them (9.71%) said they were satisfied with the number of equipment in the laboratories. 24 of the students (23.30%) said it was not always that there were enough of equipment while as many as 69 (66.9%) said they were never satisfied with the number of equipment in the laboratories. (Table 4.7)

Table 4.7 **Satisfaction with Conditions in the Laboratories**

Situation	No. of Equipment	Functioning of Equipment
Satisfied	10 (9.71%)	20 (19.42%)
Not Always	24 (23.30%)	56 (54.37%)
Never Satisfied	69 (66.99%)	27 (26.21%)
Total	103 (100%)	103 (100%)

Source: Computed from Questionnaire

The results of all these problems is that a lot of the students are unable to conceptualise a lot of difficult theories when they have not been taken through practical training

Some of the equipment in the laboratories do not function properly and they impact negatively on students' studies. The numbers of students affected by the malfunctioning of the laboratory equipment are also shown in table 4.7. Out of the 103 respondents only 20 of them (19.42%) said they were satisfied with the functioning of the equipment. As many as 56 of them (54.37%) said they were not satisfied at one time or the other while 27 (26.21%) said they were never satisfied with the functioning of the laboratory equipment.

4.2.3.3 Library Facilities

The library constitutes the spine of any academic institution, particularly in higher educational institutions. The library at the School does not have the needed facilities to merit the library of a tertiary institution. The seating capacity of forty is very limited.

With growing numbers of students the School has reconditioned an old computer laboratory into a reading room which accommodates about 45 more persons at a time. The students were asked to indicate whether the provision of the reading room solves the problem of insufficient seating capacity. They were also asked to indicate whether the books, periodicals and journals meet their material need and whether they have the maximum service of the staff during their visits to the library. Table 4.8 summarises the responses collated from the respondents.

Table 4.8 **Students' Satisfaction with Library facilities**

SITUATION	SATISFIED	NOT SATISFIED	SOMEHOW SATISFIED	TOTAL
Seating Capacity	20 (19.42%)	13 (12.62%)	70 (67.96%)	103
Books/Reading Materials	8(7.76%)	68 (66.02%)	27 (26.21%)	103
Service of Staff	52 (50.48%	18 (17.48%)	33 (32.04%)	103

Source: Computed from Questionnaire

Out of the 103 students as many as 70 of them (67.96%) indicated that they are somehow satisfied with the situation of seating capacity. Hitherto the situation was far from satisfactory. With 20 (12.62%) still not completely satisfied, there is still more that need to be done to ease the problem of seating capacity. A new library complex being put up by the government has been worked on for over eight years without going beyond the ground level.

With regards to availability and access to relevant reading material for students' programmes, only 8 of them (7.76%) are satisfied with the provision of books and reading materials. As many as 68 (66.02%) are completely not satisfied and 27 (26.21%) are in between the two groups.

Mining is a specialised science discipline and it is not very easy to acquire the relevant instructional materials. Government subvention has been woefully inadequate and it is very difficult to have the foreign exchange cover to secure the relevant materials from abroad. The GTZ has been assisting the School by purchasing some books, journals and other periodicals.

Students may perhaps only console themselves with the fact that they derive some satisfaction from the services rendered them by the library staff. Yet 18 of them (17.48%) are completely dissatisfied with the services rendered them.

4.2.4 Instructional Techniques

Before the Tertiary Education Reform period it was enough for one to acquire a higher qualification, a minimum of a master's degree, to become a university lecturer. With evaluation of the policy objectives of the reforms came the knowledge that one reason for poor performance of students in tertiary institutions was lecturers' lack of knowledge about the proper instructional techniques. Many of the academic staff became overwhelmed with large numbers of students and the best way of effectively handling large classes and the faster ways of examination assessment were all but illusions to them.

In 1996 one of the lecturers at the KNUSTSM, Tarkwa was selected to join a team of university teachers who underwent a trainers' instructions in Britain in Staff and

Curriculum Development and methods of teaching. This lecturer and one other who was selected later were made the facilitators who trained their colleagues about good instructional techniques, assessment and curriculum development. In 1997 the two lecturers organised a long vacation programme to train the other colleagues. The exercise was to have been a yearly continuing education programme but it fizzled out owing to problems with funding.

As part of the evaluation process, the study, through the questionnaire, sought to find out the extent to which the principles taught and learnt had been applied by the lecturers and whether these had impacted on their performance and on the students' learning processes. Quality of teaching has, of late, remained one of the two very important items of evaluating standards of teaching in higher education institutions. The responses to the relevant questions as provided by the students have been summed up in Table 4.9.

Table 4.9 **Students' Responses on Lecturers' Instructional Techniques.**

Responses	Satisfied	Not Satisfied	Not Always Satisfied	Total
Regularity of Lecturers	97 (95.10%)	1 (0.98%)	4 (3.92%)	102
Punctuality of Lecturers	100 (98.04%)	2 (1.96%)		102
Provision of Lecture Notes	95 (93.13%)	4 (3.92%)	3 (2.94%)	102
Conduct of Tutorials	29 (30.53%)	65 (68.42%)	1 (1.05)%)	95
Opportunity to Assess Lecturers	77(78.5%)	19 (19.38%)	2 (2.04%)	98

Source: Computed from Questionnaire

In line with the requirements of the Staff and Curriculum Development short course which was run for the lecturers the study revealed that most lecturers, as testified by 97 of the respondents (95.10%) are regular for lectures. Not only are they regular but

are also punctual for classes. Out of 102 students, 100 of them (98.04%) testify that lecturers are always on time.

Lecturers are required to make their delivery more visual and understandable by employing the use of teaching aids Table 4.10 shows students responses about the question on the use of the teaching aids by their lecturers.

Table 4.10 **Students' Responses about lecturers' use of Teaching Aids**

Use of Teaching Aids	**50% and above**	**30% - 50%**	**30% and below**
Responses	32 (32%)	21 (21%)	47 (47%)

Source: Computed from Questionnaire

Many instructors still do not employ teaching aids for lectures. Some 47% of the students attested that only 30% or less of their lecturers use teaching aids. Some 32% said that 50% or more of their lecturers employ instructional aids whereas 21% of the respondents claimed that between 30% and 50% of the lecturers employ teaching aids.

This picture may perhaps not sound too strange due to a number of reasons. A lot of the concepts in mining and the allied disciplines are better conceptualised in the field since they are very practical subjects. It is for this reason that students were previously attached to industry for one semester or one year as the case might be. Today the opportunities for this development are very narrow because of a number of associated problems. Instructors have only managed to put as much information as they can on slides. They show these on overhead projectors which were very much limited in number some years ago. Currently quite a number of the projectors have

been purchased from the academic facility user fees paid by students. A few more have also been secured through the GTZ.

The School has asked all lecturers to put their lecture materials into handy and easily accessible form (notes) and should reach students to facilitate learning. The study revealed that 93.13% of the students are satisfied that their lecturers have complied with this directive. It is only 3.92% of them who responded that they are not supplied with lecture materials in the form of notes. Only 2.94% of them said that it is not always that they have access to such notes.(Table 4.9)

To confirm that they have complied with this directive the lecturers were asked to indicate the ways in which the School had assisted them with their delivery. Only one of the 19 lecturers responded that he had not had any assistance in his preparations. Three of them said they had been assisted but only partially while all the remaining 15 affirmed that the School had been supportive.

In addition to the provision of slides, transparencies, and overhead projectors, the School has, since January 1999, been providing all lecturers with support including paper for them to put their lecture materials into well compiled notes.

Inspite of the laudable stride, many students (68.42% of them) do not have access to tutorial sessions (Table 4.9). Lecturers explain that student numbers are already large. Most of them teach beyond their maximum load and need time to do other equally important schedules. They give and mark assignments, offer academic tutorialship to students, attend numerous meetings and serve on various committees.

The ideal arrangement would have been to employ very brainy graduates as teaching assistants to do the tutorial sessions but such intelligent hands would prefer to take up appointments with the mining companies where they would be paid several times the salaries of their professors. They would also not take up teaching when they do not have any assurance to become lecturers with first degrees and not when they do not have the assurance to obtain scholarships for further studies abroad. The School's own establishment warrant does not allow the employment of more staff when there is so much talk about numbers employed and the cost involved.

The directives on Staff and Curriculum Development calls for students to assess their lecturers at the end of each semester. The study further revealed that most lecturers have availed themselves of this exercise. Out of the 98 students who responded to the question on assessment of lecturers, 77 of them (78.57%) admitted that they had the opportunity to assess their lecturers at the end of each semester with only 19 (19.38%) who responded in the negative (Table 4.9). The import of these assessments is to give the lecturers the opportunity to re-examine their methods of delivery and to improve upon them. This has also become a criterion for assessment of lecturers for promotion.

One major obstacle which is now hindering excellent training of students at the School is the question of regular access of the students to companies for practical training. With the turbulence in the mining industry as a result of declining world prices of the precious minerals, particularly gold, the local mining companies have become more cost conscious and are very sensitive to interruptions in production. This is very much associated with the periods of students' practical training. They are no more willing to pay even the paltry allowances that they used to give to the

students. The result of all these is that today some students go through their second year without having access to any company for training.

The study showed that 52.43% of students (54 out of 103) have never had the experience of industrial attachment whereas 47.57% (49 out of 103) have had the experience. This situation is very much unlike this School because it is the institution whose training programmes were hitherto synonymous with industrial training.

4.2.5 Staff Research Capabilities

As part of the second criterion of measurement which is the Quantitative Indicators, the study sought to find out whether the KNUST School of Mines, Tarkwa, has performed creditably in the area of research which is the second major function of all contemporary universities. The researcher was also interested to find out whether the researches made by the staff have resulted in publications.

It was observed that some of the researches done and consultancies conducted by the academic staff have appeared as publications in journals of international repute including the Ghana Mining Journal. Some have also appeared as proceedings at conferences, local and international.

Out of the 34 academic staff, 22 of them have got publications with the Mining Engineering Department leading the three other departments. In that department three of the lecturers have 28, 22 and 19 publications respectively. No wonder the only two professors in the School are in this department. One of the two, the current principal, a full professor, is one of the only five full professors in the whole university of which the School is one faculty. Table 4.11 indicates the total number of publications to the credit of the lectures in the School.

Table 4.11 **Total Publications of Lecturers at KNUSTSM, Tarkwa (1976-2000)**

Department	No. of Lecturers	No. Who Have Published	Total Publications
Mining Engineering	11	10	102
Geology/Survey	8	4	14
Mineral Technology	4	3	13
Applied Engineering Science	11	5	9
Total	34	22	138

Source: Computed from Field Data

It is in the interest of each lecturer to pursue rigorous research and publications since their progression depends to a very large extent on the number of publications they have to their credit. It is, however, not very easy to do research since it costs substantial amount of money. Even though lecturers are paid research allowances these are said to be inadequate to do very serious research. Major researches need enough financial support.

Government, realising the gravity of the problem with research activities in all the universities, and realising that it was abysmally low, set up the Universities Research Fund in 1993 as part of the Tertiary Education Project Phase 1. Research in all the universities had been on the decline since the middle of the 1970s. The research fund was meant to reverse the decline in scholarship and professional advancement among academic staff. The World Bank provided $1.0 million to support this project (Govt. of Ghana, 1998).

Members of the academic staff in all universities, with the exception of the University for Development Studies which had been specifically excluded by the World Bank, were eligible to apply for funding of research projects. The only conditions for obtaining a research grant was that the projects that were to be funded were to be of

high quality, relevant to Ghana's socio-economic development and have potential for immediate application and for a significant addition to knowledge.

The disbursements, however, run into difficulties such that out of a total of 182 preliminary proposals submitted, the full proposals were reduced to 104 and yet only 30 received funding. This was for the period 1994 -1997. Table 4.12 indicates the various proposals presented by all the universities concerned and how they fared.

Table 4.12 **Statistical Data on Research Proposals submitted, Processed and Funded, 1994 – 1997**

Description	U.C.C.	U.G.	U.S.T.	UCEW	Total
Round One					
Preliminary Proposals	18	6	12	10	46
Full Proposals	44	2	8	6	30
Proposal Funded	4	1	7	3	15
Round Two					
Preliminary Proposals	2	23	12	-	37
Full Proposals	2	10	6	-	18
Proposal Funded	2	1	1	-	4
Round Three					
Preliminary Proposals	13	30	40	19	66
Full Proposals	7	15	3	11	36
Proposal Funded	1	6			7
Round Four					
Preliminary Proposals	4	17	12		33
Full Proposals	3	7	7		20
Proposal Funded	1	-			4

Source: Secretariat of the Universities Research Fund Management Programme, University of Ghana.

For the whole KNUST, only eight, out of initial proposals of 76 and full proposals of 24, were funded. There are over 500 lecturers in the university; therefore funding for only 8 research proposals out of 24 finally submitted within the period under review is only paltry, meagre and mean. On that score the current number of publications of the staff at KNUSTSM, Tarkwa, could be described as being high and commendable.

4.2.6 Academic Staff Quality

The quality of work or service that the staff of the School are able to accomplish, particularly regarding teaching, is dependent heavily on their level of qualification. All the academic staff have either master's or doctorate degrees even though a number of them joined the staff with first degrees.

The School has aided a lot of the staff through the acquisition of Ghana Government and Commonwealth Scholarships to pursue these higher qualifications. Currently there are eleven lecturers at post who acquired their master's degrees after they had joined the staff and through the efforts of the School. In like manner six have had their doctorate degrees through the School's support, three of which were through the GTZ supported sandwich programmes. Six are still on doctorate programmes outside the country.

These figures exclude a number of the staff who refused to return to the country after the pursuit of their master's and doctorate degrees. The School seems undaunted by these developments and continues to encourage staff to take advantage of opportunities for studies. It also offers opportunity for continuing education to the lecturers through GTZ mostly outside the country. Without this the School will be eluded of the academic prowess that it wishes to achieve, particularly when it wishes to attain a University College status.

4.2.7 Age Profile Analysis

Apart from the level of qualifications age has a lot to do with staff capabilities and the quality of teaching offered in an institution. By the effectiveness criterion of assessing the quality of teaching in tertiary institutions Addae-Mensah (1999) postulates that the

ideal condition is for the majority of the teaching staff in a higher education institution to be 45 years or below. Table 4.13 gives a picture of the age profile situation of the academic staff at the KNUST School of Mines, Tarkwa.

Table 4.13 **Age Profile of Staff of Departments at KNUST School of Mines, Tarkwa.**

Department	< 30 Years	30-40 Years	41–50 Years	51–60 Years	> 60 Years	Average Age
Mining Engineering	-	1	6	4	-	50
Geology/Survey	-	2	5	1	-	45
Mineral Technology	-	3	1		-	40
Applied Engineering Science	-	1	4	2	4	52
Total	-	7	**16**	7	**4**	**47.94**

Source: Computed from Field Data

The average age of all the lecturers at post as at 1st January 2001 is 47.94, approximately 48 years. The Mineral Technology Department has the youngest lecturers whilst the Applied Engineering Science Department has the oldest members, with two retirees already and two more to retire at the end of the 2000/2001 academic year. About half of the lecturer population are between 41 and 50 years with the remaining number shared below and above this threshold as indicated in the table.

Figures 4.1 to 4.3 give pictorial impressions about the age profile, disciplines and academic ranking of the staff at KNUSTSM, Tarkwa.

Fig. 4.1 Staff Breakdown for KNUSTSM, Tarkwa, by Discipline

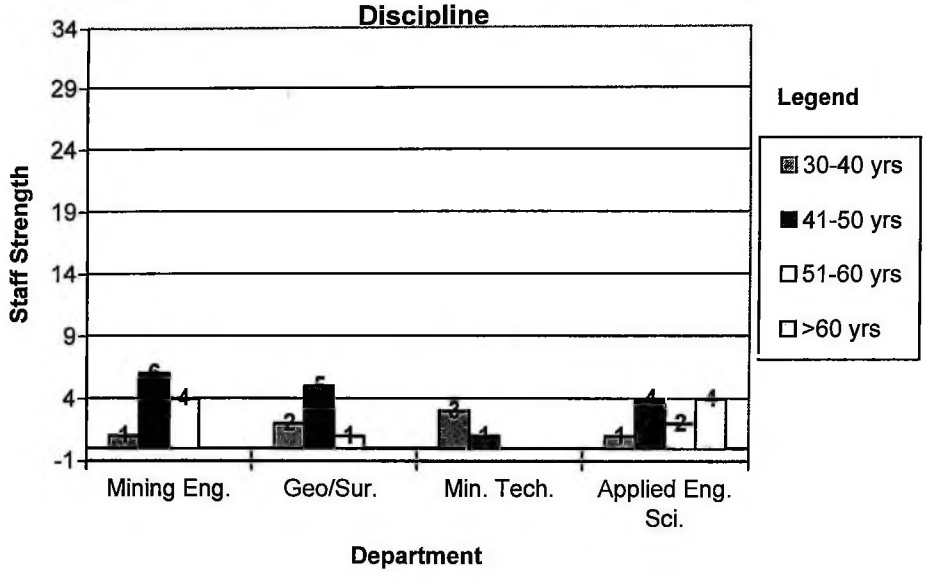


Fig. 4.2 Staff Breakdown for KNUSTSM, Tarkwa, by age

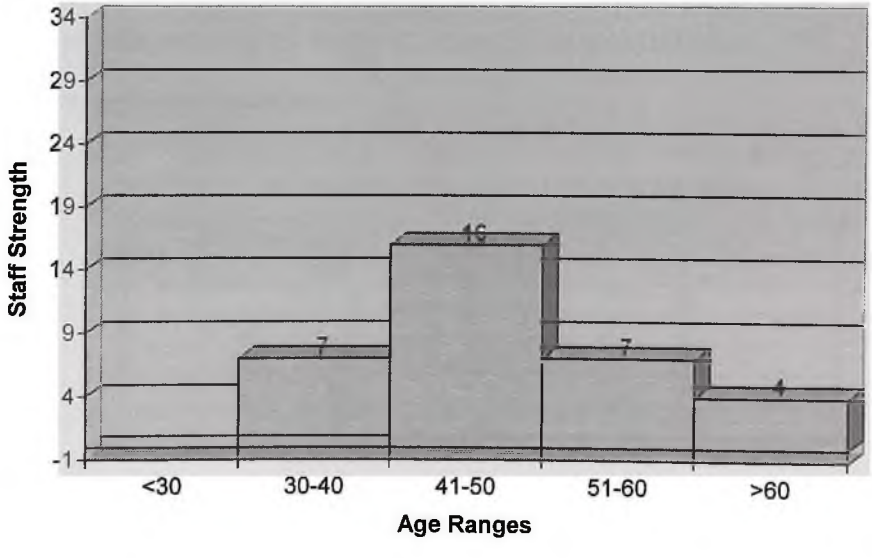
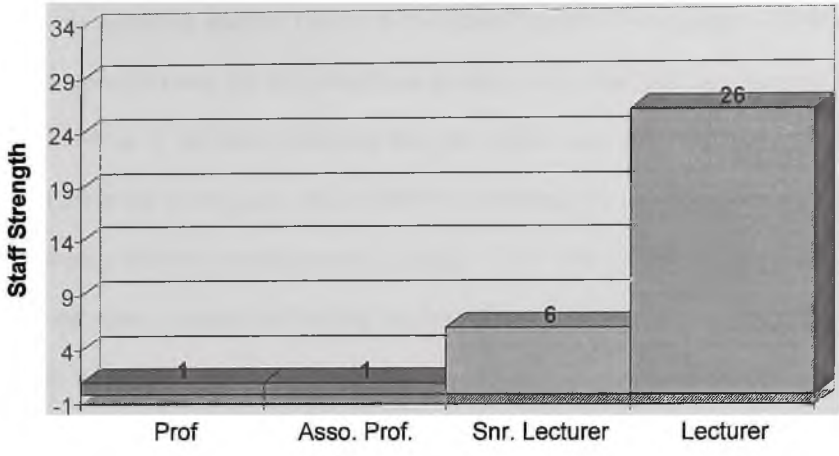


Fig. 4.3 Staff Breakdown for KNUSTSM, Tarkwa, by Academic Ranking



<30	0	0	0	0
31-40	0	0	0	7
41-50	1	1	2	11
51-60	0	0	3	7
>60	0	0	1	1

Academic Ranking

A general overview of the academic staff strength in Ghana universities shows that just under 1% of the staff in all the universities are under 30 years of age. About 20% are between the ages of 30 and 40, 52% between 41 and 50 years, 26% between 50 and 60 years and about 8% are above 60 years of age (Gaisie-Nketsiah, 1998). These are summarised in table 4.14

Table 4.14 **Academic Staff Strength in Ghana Universities**

AGE RANGES (YEARS)	PERCENTAGES (%)
< 30	1
30 – 40	20
41 – 50	52
50 60	26
> 60	8
Total	1447

Source: Gaisie-Nketsiah, (1998)

Comparing this general situation with the situation at KNUST School of Mines, Tarkwa no academic staff at Tarkwa is less than 30 years. Even though 11.76% of them are over 60 years, the four people are in their early sixties and their contract can be renewed up to 65 years, meaning that the School can still make use of their services for a few more years. About 20.59% are between 51 and 60 years which is a lower average than the overall national average of 26%. The 20.59% that fall between 30 and 40 years is about the national average. This means that with 47.06% falling between 41 and 50 years, the School has the opportunity of using the services of nearly half the number of the teaching staff for a lot more years to come.

This conclusion is, however, based on the assumption that there would not be any resignations or other situations which might contribute to the reduction of their numbers. This point is very germane since the School has already lost a number of staff through voluntary retirements, vacation of posts, resignations and refusal to return home after study leave or sabbatical leave outside the country. Table 4.15 gives an insight into the actual situation at the School today.

Table 4.15 **Loss of Academic Staff at KNUSTSM, Tarkwa by Departments**

Department	Number Lost (1976-2000)
Mining Engineering	2
Geology/Survey	11
Mineral Technology	2
Applied Engineering Science	2
Total	17

Source: Computed from Field Data

In any case, the average age of the academic staff is 48 years, and by the effectiveness principle the School seems to be a little disadvantaged. The reality, however, is that the majority of the academic staff joined the School in their early 30s and has,

therefore, spent a lot of their prime years serving the School. In fact a handful of them began lecturing before age 30.

4.3 Comments of Internal Assessors

By the methodology adopted for this research work the third evaluation criterion is to make reference to statements or the assessments of those who are directly involved in the institution being evaluated, namely the students, the teaching staff and the administrators.

4.3.1 The Principal

In the opinion of the Principal, the KNUST School of Mines, Tarkwa, has performed well and improved in almost all areas of its operations. After its affiliation to KNUST, four strong departments have been set up. Academic staff developments have been high. There are now seven doctorate degree holders, two of whom are professors. There are also six senior lecturers. Now all diploma programmes have been replaced by degree programmes to conform to the general practice in the main university. A completely new and bigger computer laboratory has been set up with an Internet Café. The teaching staff have been encouraged and assisted with materials to put their lecture notes together. The masters degree programme in Mining Engineering is now run on the modular system to assist workers who should not necessarily have to abandon their jobs for school.

Some physical developments have taken place including the building of a guest house at Tarkwa, the acquisition of two new ones, one in Accra and the other on the main University campus in Kumasi. Renovations of numerous physical facilities on campus are on going.

Another area of critical importance is the methods of decision making in the School. All major decisions and daily administrative responsibilities emanate from and end up in the departments. This is because all heads of departments are members of the School Board where the decisions are taken and approved of.

The Principal attributes a lot of the School's achievements to the contribution of the teaching staff. The fact that there are a number of senior lecturers is an indication of the fact that the academic staff are actively doing research. In fact academic staff promotions depend largely upon the number of publications that go to their credit. Again extension services (through consultancies) are being seriously pursued.

In his assessment, therefore, the Principal sees the School as having advanced positively and gained much in its strides as an academic institution.

4.3.2 Vice Chancellor

During the interview, the Vice Chancellor was represented by the Pro Vice Chancellor. He supports the idea that the School is preparing to become a University College. In his opinion the Vice Chancellor sees the School as having expanded its operations and has the potential of better living up to its objectives of training personnel for the mining industry.

He believes also that it is natural for parts of the University to expand. Since the School has expanded enough, it could add up the Basic Sciences and other relevant disciplines as additional specialised fields of study. So far the products have met the requirements of the mining industry and the School has had the right calibre of staff for training tertiary institution students. He believes, however, that there should be periodic review of the programmes by both the School and industry. In his

assessment, the Vice Chancellor says that the School has performed creditably and should be assisted to expand further.

4.3.3 Registrar

The Registrar of the University has the opinion that the School has lived up to its objectives, to train up the required personnel of the right calibre for the mining industry. He sees the infrastructure of the School to be good enough to undertake tertiary programmes of international standards.

The positioning of the School is as well good. The mandate of the University to bring the School up has been achieved and things should not go on the same way indefinitely; moreover it has the right calibre of staff to train students. For these reasons the Registrar recommends that the School advances further to become a University College.

4.3.4 Director, IMME

The Director of Institute of Mining and Mineral Engineering, of which the KNUST School of Mines, Tarkwa, is a part, recommends the School for its achievements so far. The thrust of his recommendation hinges on the quality of the products of the School. He sees the absence of any query from industry about the trainees and the fact that they continue to admit them as a very positive achievement. The Director also sees the level of the knowledge of the academic staff as being comparable to any that can be found in any good university. He grades their research outputs as very high. In his opinion, the School has performed very well.

4.3.5 Heads of Academic Departments and Lecturers

The Heads of the Academic Departments of the School are satisfied with the performance of the School. Two of them are fully satisfied with the level and number

of researches conducted while the other two think that there is some work to be done to rate it as very high. They are all, however, fully satisfied with the extent of departmental collaboration which has existed among the departments over the years.

Each department is serviced by the lecturers of other departments, thus making the different programmes offered in the School to be interdisciplinary. A lecturer in one department is said to have taken lecture notes from a colleague in a different department and adapted them so easily to suit his own syllabus. The examples he gives have now become as relevant to students of the department from which he picked the notes.

Where knowledge permits, lecturers supervise students who belong to departments other than their own and lecturers from different departments sometimes do common research and consultancies together.

From these perspectives all four heads of academic departments of the School assess the performance of the School to be very high. Out of 19 respondent lecturers, 15 of them confirm these positive benefits of the School with only 4 of them who believe that a little more should be done to attain very high level of achievement. The fact that the School has moved away from diploma and sub-diploma programmes to all degree is an indication of the strides it is making.

4.4 Consultancies, Statements of External Experts or Peers

The fourth evaluation criterion adopted for this study as propounded by Ranom et al has to do with statement of external experts or peers. The external experts are usually from higher education institutions of similar stature while the peers are from other

institutions not necessarily of similar stature but which have some link with the institution being evaluated.

The comments made either by external experts or by peers are in respect of services rendered as well as the academic prowess of the institution which is being evaluated.

Services in the form of consultancies have become serious undertakings in the School for two reasons. First, they bring in extra income to the researchers to supplement their livelihood. Secondly, they provide information for publications which are badly needed for assessment and promotion. At present the University insists that all consultancy jobs undertaken by staff should be documented through the Heads of Departments. The rationale is to ensure that a percentage of the proceeds are paid into the University (School's) coffers. Table 4.16 shows the number of recorded consultancies undertaken by the staff in the departments of the School from January 1996 to the middle of the year 2000.

Table 4.16 **Number of Consultancies Done By Lecturers by Departments, KNUSTSM, Tarkwa (January 1996 to May 2000)**

Department/Sections	Jan 1996 – Dec. 1996	Jan. 1997 – Dec. 1997	Jan. 1998 – Dec. 1998	Jan. 1999 – May 2000	Total
Mining Engineering	14	12	10	13	49
Geology/Survey	14	12	12	8	46
Mineral Technology	3	4	2	9	18
Applied Engineering Science	9	8	6	7	30
Building & Maintenance		2		2	4
Total	**40**	**38**	**30**	**39**	**147**

Source: Computed form Accounts Office, KNUSTSM, Tarkwa

The beneficiaries of the consultancy services of the School are mainly the mining companies and allied service organisations. Some of the major works conducted by the academic staff include:

- Running of short courses for various organisations
- Quality Control on Construction of Leach Pad
- Quality Control on construction of conveyor embankment
- Survey Field Work
- Pitting and Oil Sampling
- Environmental Management Plan
- Recovery of gold from used crucibles
- Metallurgical test work
- Survey of Boundary Litigation
- Tailings Dam Construction
- Training of Survey Assistants
- Material Selection from Glim
- Dam Construction Quality Control on Construction of Main Conveyor Embankment

Some of the major clients of the School's include:

- AGC Ltd, Iduapriem Mine, Tarkwa
- Satellite Goldfields Ltd
- Abosso Goldfields Ltd.
- St. Jude Resources
- Bogoso Gold Ltd
- Prestea Sankofa Goldfields
- High Court, Tarkwa
- Survey Department

- Ghana Bauxite Company Ltd
- Bulk Oil Storage Transportation and
- Ghana Government.

From the data available every indicator points to the fact that a lot of the academic staff are involved in consultancy services.

The other side of the evaluation is about the comments made by the peer organisations. The study sought to establish whether the relevant peer organisations have so afar been satisfied with the various forms of assistance (extension services) rendered them by the School, Top executives of eleven organisations were interviewed for the purpose. The organisations are:

- AGC Ltd, Iduapriem Mine, Tarkwa
- Goldfields Ghana Ltd, Tarkwa
- Abosso Goldfields Ltd
- Bogoso Gold Ltd
- Environmental Protection Agency, Tarkwa
- Small Scale Mining Corporation
- Precious Minerals Marketing Corporation
- Mines Department
- Care International (NG0) based at Tarkwa
- District Office, Ghana Education Service, Tarkwa
- Wassa West District Administration

The views collated from these organisations indicated that the KNUST School of Mines, Tarkwa, has been extremely helpful to them and, therefore, evaluated the

services rendered them as high. A few of the ways in which the School has assisted these organisations and the Wassa West District include the following:

- Provision of premises for organising National Mine Safety Day competitions.
- Collaboration with mining companies to monitor and control environmental pollution
- Testing of samples from small scale miners in the School's laboratories
- Review of Impact Assessment reports from the Environmental Protection Agency, Tarkwa, of activities of mining companies
- Monitoring of dust particles in the atmosphere for the District Assembly
- Use of the School's premises for running short courses for teachers in the District by Care International (NGO)
- Reliance on staff of the School for Guidance and Counselling to SSS students in the District
- Assisting District Directorate of Education to select best teachers usually SSS Science Teachers for District Teachers Awards Competition
- The School's Frequency Modulation (FM) station is the only one in the Wassa West District. It provides information, education and entertainment to the residents of the District.
- Helps develop pre tertiary education in Ghana – it pays the salaries of some of the teachers in its Primary/Junior Secondary School (the results of the JSS students are among the best in the region).
- The School is involved in the development of curricula and syllabi for tertiary (non University institutions). The current Principal was the leader of the team

that prepared the course structure and syllabi for computer studies at the beginning of the current polytechnic tertiary programmes in Ghana.

The common strand which runs through all the comments made by the peer institutions is that the School has been extremely beneficial to them.

There has also been an assessment of the School by an external expert. In 1997 some members of the academic staff at the Camborne School of Mines, University of Exeter in Britain, paid a visit to Tarkwa. The objective of the visit was to establish an education collaboration with the Tarkwa School. After examining the past examination questions and some of the School's facilities, their final comment about Tarkwa was that the standards of the School's examinations were very high. The two Schools' then exchanged past examination questions.

4.5 Other Evaluation Criteria

In addition to the four evaluation criteria it is also useful to assess the School about issues which are currently in vogue and have of late gained so much currency in university governance in Ghana. These are:

(i) Postgraduate training

(ii) Gender balance and

(iii) Financial sufficiency

4.5.1 Post-graduate Training

The Government of Ghana has tasked the universities to embark upon more vigorous local post-graduate training. The trend now is that government has reduced its assistance for post-graduate studies outside the country especially for second degree programmes.

Government has stated that it wishes to support studies for doctorate programmes if there is shortage of facilities for local training and in such cases the foreign training institution must be prepared to have sandwich programmes in which part of the programme could be handled locally.

The KNUSTSM, Tarkwa, has been involved in post-graduate training since it began the degree programmes. Table 4.17 shows the number of post-graduate students turned out by the School from 1982 to 2000.

Table 4.17 **Turnout of Post-graduate Students at KNUSTSM, Tarkwa (1982-2000)**

Year	PGD	MSc	MPhil	PhD	Total
1982/83	4				4
1983/84	6				6
1984/85	4				4
1985/86	8				8
1986/87	6				6
1987/88	4				4
1988/89	6				6
1989/90	7				7
1990/91	6				6
1991/92	4				4
1992/93	11		1		12
1993/94	6			2	8
1994/95*					
1995/96	6				6
1996/97	8				8
1997/98	6	3	1		10
1998/99	5	2			7
1999/00	5				5
Total	**102**	**5**	**2**	**2**	**111**

*No graduation due to closure of Universities in Ghana.

Source: Academic and Student Affairs Office, KNUSTSM, Tarkwa

This achievement might perhaps not be too strange because the previous syllabus was fashioned alongside a system which was existing in Germany at the time. It was a

continuous five-year programme in which the fifth year was used for a post-graduate diploma programme.

Some of the graduates, however, opted out of the fifth year programme because the degree certificates were issued separately from those of the post-graduate diploma.

The Policy Objectives of the Reforms to the Tertiary Education System (Government of Ghana, 1998) set an objective to the universities to allocate at least 10% of their total enrolments to postgraduate programmes in the areas regarded as national priority. The idea is to ensure an adequate and reliable supply of trained manpower to provide leadership in all economic and social sectors. This norm ought to have been achieved in 1992.

For a number of reasons the targets could not be attained by the universities. Table 4.18 depicts the real situation as at the due date and beyond.

Table 4.18 **Share of Post-graduate Students in Total Enrolment, Universities of Ghana**

Year	University of Cape Coast	University of Ghana	K. N University of Science and Technology
1991/92	6.16	7.24	6.87
1992/93	5.96	7.49	7.57
1993/94	8.69	7.57	9.51
1996/97	9.19	6.77	9.59

Source: Government of Ghana (1998).

To assess the KNUST School of Mines, Tarkwa, table 4.19 compares the total number of graduates over the years with those who pursued post-graduate programmes.

It can be observed that out of the seventeen years under review, twelve of them had post-graduate students which exceeded 10% of the total graduates with only five coming below the target. Comparing the figures with what obtains in the main universities where none has reached the set target the KNUST School of Mines, Tarkwa, can be said to have done very well. Figure 4.4 gives a pictorial impression of the breakdown of the total graduates of the School up to year 2000.

Table 4.19 **Share of Post-graduates in Yearly Total Output, KNUSTSM, Tarkwa**

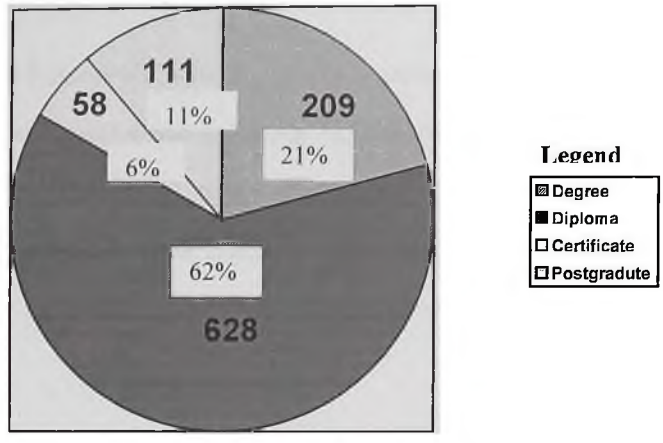
Year	**Total Graduates	Total Post-graduates	Percentage Post-graduates
1982/83	34	4	11.68
1983/84	29	6	20.69
1984/85	29	4	13.79
1985/86	31	8	25.81
1986/87	30	6	20
1987/88	34	4	11.76
1988/89	34	6	17.65
1989/90	34	7	20.59
1990/91	38	6	15.79
1991/92	59	4	6.78
1992/93	57	12	21.05
1993/94	62	8	12.90
1994/95*			
1995/96	77	6	7.79
1996/97	94	8	8.51
1997/98	88	10	11.36
1998/99	125	7	5.60
1999/00	136	5	3.68

* No graduation due to closure of universities in Ghana

** The graduates pursued approved university programmes from Certificate to PhD levels

Source: Academic and Student Affairs Office, KNUSTSM, Tarkwa

Fig. 4.4 Graduates by Programmes at KNUSTSM, Tarkwa. (1982-2000)



4.5.2 **Gender Balance**

In addition to the provision of greater access for all, the White Paper on the Reforms to the Tertiary Education System (1990) calls for a significant increase in the proportion of women students in tertiary institutions. Indeed the norms require that women should make up 50% of enrolments at the tertiary level. Unfortunately this objective has not been achieved as shown in table 4.20

Table 4.20 **Percentage of Women Students Enrolled in Tertiary Institutions in Ghana**

Institution	1991/92 %	1994/95 %	1996/97 %	1997/98 %	1998/99 %	1999/00 %
UCC	23	25	27	26	26	25
UCEW	-	29	25	27	19	31
UDS		7	13	14	14	15
UG	24	24	31	26	30	30
KNUST	18	20	21	20	20	21

Source: Government of Ghana (1998).

At the end of the 1999/2000 academic year, the percentage of women had not gone beyond 31 of the total enrolments in any one university in Ghana.

The situation is worse off at Tarkwa. Not until the 1987/88 academic year when one female enrolled for a certificate programme in Mining Engineering not one female had been on the School's enrolment for any tertiary programme. A few females have since enrolled to pursue various programmes but the numbers have been abysmally low. Table 4.21 shows the numbers and percentages of female enrolments in the School over the years.

Table 4.21 **Percentage of Fresh Women Enrolments at KNUSTSM, Tarkwa**

Year	Total Fresh Enrolment	Total Females	% of Fresh Female Enrolment
1987/88	196	1	0.51
1991/92	244	1	0.41
1996/97	220	4	1.86
1997/98	232	5	2.16
1998/99	235	8	3.40
1999/00	241	11	4.56
2000/01	198	7	3.54

Source: Computed from Field Data

It may be noted that for a good number of years there have not been female enrolments in the School. Perhaps the situation can be explained and understood. For a very long time now certain professions have traditionally been regarded as the preserve of men. Mining Engineering and the related disciplines are among such professions. Secondly the International Labour Organisation (ILO) Convention 45 debarred women from working underground. Since mining takes the employee underground women would not opt for Mining Engineering only to be limited in the scope of job they could undertake with all the store of knowledge. ILO Convention 100, however, makes provision for equal opportunities for work for both males and

females thus negating Convention 45. The Constitution of the Republic of Ghana (1992) gives much credence to ILO Convention 100. The relevant portion, Section 17 (4) of the Constitution, states that "A person shall not be discriminated against on grounds of gender, race, colour, ethnic origin, religion, creed, social or economic status".

The School is now encouraging female enrolments and that, perhaps, explains why today a few females are on the School's enrolment list. The result of these developments is that to date only one female has graduated with a first degree in Mining Engineering, and seven with diploma in Mining Engineering and related disciplines.

4.5.3 **Financial Sufficiency**

The KNUST School of Mines, Tarkwa, like the other public higher education institutions in the country, relies almost entirely on government subvention for running. Because of this practice it runs on the funds which are available to it only. The consequent insufficiency of funds has become chronic. Table 4.22 indicates the percentage of budgeted funds which were paid by government to the School over a five year period.

Table 4.22 **Percentage of Budgeted Funds Paid by Government to KNUSTSM, Tarkwa.**

YEAR	1994	1995	1996	1997	1998
% of budgeted funds obtained	86.44	79.32	73.88	69.09	62.35

Source: Computer from Field Data

The figures give an indication that government subvention to the School has been decreasing with the years. Ironically the funding keeps decreasing when all higher

education institutions in the country including KNUST School of Mines, Tarkwa, are under obligation to increase enrolment.

Before 1999, the School, in line with government directive, had adopted the itemisation budget system which had the following items:

Item 1 - Personal Emoluments
Item 2 Travelling and Transport Expenditure
Item 3 - General Expenditure
Item 4 - Maintenance, Repair and Renewals
Item 5 Other Recurrent Expenditure
Item 6 Subvention
Item 7 - Construction Works
Item 8 Plant, Equipment, Furniture and Vehicles
Item 9 Other Capital Expenditure (Public Investment Programme)

From 1999 the Government adopted the Medium Term Expenditure Framework (MTEF) Budgeting System and the School had to fall in line by preparing its estimates based on this new method. The MTEF System has four items as follows:

Item 1 Personal Emoluments
Item 2 Administrative Expenses
Item 3 Service Activities
Item 4 - Public Investment Programme (PIP)

The financial sufficiency of the School did not improve with this new system of budgeting. It grew worse rather. The percentages received of the budgeted items in the MTET System for the year 1999 are as contained in table 4.23.

Table 4.23 **Percentage Payments Made to KNUSTSM, Tarkwa, by Itemisation, 1999**

Item	% Received
1	83.95
2	28.89
3	26.14
4	27.05
Total	51.09

Source: Accounts Office, KNUSTSM, Tarkwa

The funds released by government are expected to be expended under seven main cost centres as follows:

Academic Expenditure		45%
General Educational Expenditure		15%
Library Expenditure	-	10%
Central Administration Expenditure		6%
Municipal Services Expenditure	-	15%
Staff and Student Facilities	-	5%
Miscellaneous Expenditure	-	4%
Total		100%

If the School should go strictly by these directives it means that with only 51.09% of budgeted funds released, most areas of operation will continue to suffer from cash trap situations. It would thus seem that the School should source extra funds from elsewhere to be able to run effectively.

From the interview schedule it is clear that the top university administrators share this view. The Registrar of the University is in support of the idea that the School should

commercialise a lot of its services to earn enough to supplement government subvention which will always be needed. In addition to commercialisation, both the Vice Chancellor and the Director of the IMME endorse privatisation as additional income generating ventures for financial support.

The other important source of supplement to the budget could come from consultancy services but this source has not assisted the School much. The University regulations on consultancy services state that staff who use the University's facilities for their jobs should contribute 20% of the gross proceeds to the University. For those who do not use university facilities, they must contribute 10%.

The available figures show that what has so far been paid to the School by way of consultancy contributions has been quite small. By way of illustration the research threw light on the latest figures on consultancy services documented with the Finance Office for a one and a half year period between January 1999 and May 2000.

Out of a total of ¢187,866,249.80 accrued by the academic staff who engaged in consultancies the amount that was paid to the School's coffers totalled ¢32,873,142.63 which came up to 17.50%. If one considers the fact that within the first five months of the year 1999 the shortfall in funding to the School which was 49% amounted to ¢2,456,180,302.00, then the thirty two million cedis paid to the School is only paltry. The consultancy payments to the School for the period were the equivalent of 1.33% of the shortfall in the School's subvention. It is doubtful whether the contributions made could pay for the actual cost of the use of the equipment and machinery for generating the rewards made.

Without the technical assistance of the GTZ the School does not currently have much by way of other sources of funding. It is thus right to state that the School has fared rather badly on the question of financial sufficiency.

4.6 Summary of the Evaluation Criteria

Table 4.24 gives a summary of the criteria for evaluating KNUST School of Mines, Tarkwa, and the results of the study. There are 22 positive items, 4 negative items and 3 with doubtful, debatable or unsatisfactory results.

Table 4.24 **Summary of Assessment Criteria for KNUSTSM, Tarkwa**

1	**Achievement Test and Performance (Examination Results)**	+		
2	**Quantitative Indicators**			
	a. Relevance of Programmes	+		
	b. Employment Opportunities			?
	c. Inputs for Teaching			
	(i) Classroom Space	+		
	(ii) Laboratories and Equipment			?
	(iii) Library facilities			
	Seating Capacity			?
	- Reading Materials			
	- Staff Service	+		
	d. Instructional Techniques			
	(i) Regularity of Lecturers	+		
	(ii) Punctuality of Lecturers	+		
	(iii) Teaching Aids	+		
	(iv) Lecture Materials	+		
	(v) Assessment of Lecturers	+		
	e. Staff Research Capabilities	+		
	f. Academic Staff Quality	+		
	g Age Profile		-	
3	**Comments of Internal Assessors**			
	a. Principal	+		
	b. Vice Chancellor	+		
	c. Registrar	+		
	d. Director, IMME	+		
	e. Heads of Academic Departments	+		
	f. Lecturers	+		
	g. Students	+		
4	**Consultancies, External Experts or Peers**			
	a. Consultancies	+		
	b. External Peer (Camborne School of Mines)	+		
	c. Ministries, Departments, Agencies	+		
5	**Other Evaluation Criteria**			
	a. Postgraduate Training	+		
	b. Gender Balance		-	
	c. Financial Independence		-	
	Total	22	4	3

Source: Summary of Institutional Assessment Criteria

Therefore, the hypothesis that the KNUST School of Mines, Tarkwa, has not lived up to its objectives cannot be accepted. On the contrary the School has chalked a lot of successes and has more than fulfilled the objectives for which it was set up.

From the analysis made one can make a summary of the research work, make recommendations and conclusions which constitute the content of the fifth and the final chapter.

CHAPTER FIVE

SUMMARY, RECOMMENDATIONS AND CONCLUSIONS OF THE STUDY

5.0 Summary

The study sought to find out whether KNUSTSM, Tarkwa, had performed well since it became a tertiary institution some twenty-five years ago. It was hypothesised that the School had not lived up to fulfil its mission and had not justified the purpose for its establishment. It was also aimed at finding out whether the growth process of the School could be set as an example for some other institutions for nurturing in the country.

The results of the study have disproved the hypothesis and have shown that to a very large extent the School has performed creditably well. The five broad areas of assessment were broken further into twenty-nine items; twenty-two of the indicators came out to be positive; four were negative and three were debatable or unsatisfactory.

The results of the Achievement Test and Performance link up with the quality of the graduates of the School which have been found to be high. Some of the alumni have combined Mining Engineering with Business Administration at the master's level and are working with various banking institutions in the country. With background in Mining Engineering such employees can easily undertake Mineral Investment Analysis of mining organisations which seek financial assistance from the banks. Most of the Quantitative Indicators were also found to be positive. They include the relevance of the School's programmes, inputs for teaching, library facilities, instructional techniques, staff research capabilities and academic staff quality. It is a

very positive sign for students to indicate that most of the academic staff of the School are regular and punctual at lectures and employ useful teaching aids and techniques for instructions. The research capabilities of most of the academic staff have shown to be commendable.

All the Internal Assessors from the Vice Chancellor through to the students made positive assessments of the School through their responses to the questionnaires and the question guides.

The study has also revealed that the academic staff of the School are seriously engaged in research and consultancies. They do not only make publications out of them but also depend on them as income supplements. The External Experts and Peer organisations which were asked to evaluate the School, have all made assessments to its credit. The School has also done well in post-graduate training.

There have as well been negative results from the study. These emanate from reading materials, age profile, gender balance and financial sufficiency.

Some of the products of the School have come up as good academics. Currently six of the lecturers of the School are alumni. Two of the six have had their doctorate degrees; one with a master's and two others are still pursuing studies for doctorate degrees. These exclude those who have qualified and are either lecturing or have been involved with various organisations outside the country.

5.1 Recommendations

5.1.1 Institutions and Possible Affiliations

One objective of the study was to find out whether the experience of KNUSTSM, Tarkwa, could be replicated in the country. The affiliation of KNUSTSM, Tarkwa, to KNUST, Kumasi, for nurturing has proved to be very successful with the result that the School is on the verge of becoming a University College. It is recommended that certain institutions in the country in line with the Policy Objectives of the Tertiary Education System (1998), be affiliated to universities in Ghana for nurturing using the Tarkwa experience as a case. The following propositions are made for consideration:

Table 5.1 **Institutions and Possible Affiliations**

Institutions	Institutions for Possible Affiliation
Teacher Training Colleges	University of Cape Coast - University College of Education, Winneba
Nursing Training Colleges	University of Ghana Medical School - School of Medical Sciences, KNUST, Kumasi - Department of Nursing, University of Ghana
School of Forestry, Sunyani	- Institute of Renewable Natural Resources, KNUST, Kumasi
Ghana Institution of Journalism	- School of Communication Studies, University of Ghana
Agricultural Training Colleges	- The Agriculture Faculties of the Universities in Ghana
National Film and Television Institute (NAFTI)	School of Performing Arts and School of Communication Studies, University of Ghana
School of Bilingual Secretaryship	- Department of Management Studies, University of Cape Coast

Proposed by Author

In nurturing them into maturity, the mature (tertiary) institution would be expected to be involved in the development of academic programmes of the growing institutions.

In doing so however, the implementing authorities should be mindful of the possible negative affects because of the experience of KNUSTSM, Tarkwa. Where the parent institution is placed far away from the nurtured one, duplication of functions and travels to the main campuses for consultation could be expensive. The administrative structure can also be tall and make the system more bureaucratic.

This caution should be noted as Tamale Polytechnic did it in a more convenient way. During the conversion of Tamale Technical Institute into a polytechnic to run tertiary programmes, the top administrative and academic hierarchy of the Institute went down to Tarkwa to confer with the authorities of KNUSTSM, Tarkwa, to tap the Tarkwa experiences through weeks of discussions which seriously involved the researcher.

Without any affiliation and regular consultations outside their environment, Tamale Polytechnic operates without incurring extra expenditures on travelling. The question of loss of several man-hours through absence from duty has also been avoided.

5.1.2 **Reading Materials**

It is quite serious for an academic institution not to be sufficient in reading materials. The study revealed that a number of relevant literature for Mining Engineering and related disciplines are not available on the local market, not to talk of the high cost of

procuring them. The School has set up a very well stocked computer laboratory with Internet café.

It is recommended that the School establish links with electronic libraries in other universities abroad to make available literature in Science and Engineering. Some of the very famous mining universities abroad could make relevant literature available which could be downloaded by KNUSTSM, Tarkwa, for use by both students and staff. This is recommended as a matter of urgency because the lack of sufficient literature can seriously affect delivery of lectures by the academic staff as well as the consumption of relevant material by students. It may also be useful for the School to link up with the Ghana Book Trust and Non Governmental Organisations which are into education to source out relevant books and other relevant learning materials from abroad. It is for the reason of insufficient literature that the School has asked all academic staff to put their lecture material in the form of notes and make them available to students. The students did indicate in the study that most of the lecturers had complied and the results have been said to be very encouraging.

5.1.3 **Departmental Collaborative Publications**

A number of publications have emanated out of the researches and consultancy jobs undertaken by the academic staff of the School. The Mining Engineering Department is the leading department in the publications of research papers with the others following.

There is, however, a lot of departmental collaboration in teaching and consultancies. It is recommended that the three other departments ensure that the collaborative researches come up in the form of publications. This will add up and increase the publications of the other departments which are needed also for promotions by staff and for development of the various departments.

5.1.4 Lecturer-Student Collaborative Researches and Publications

The research indicates that the staff of the School are deeply involved in a lot of researches and consultancies which result in a lot of publications. The responses from the questionnaires, however, depict a complete absence of lecturer-student collaborative researches. Students undertake their project work or write their thesis without any recourse to lecturers' research and consultancy assignments. There were 97 out of 103 of the student respondents (94.17%) who indicated that they had never had any opportunity of getting involved in the research assignments of their lecturers.

It is recommended that the School encourage the lecturers to assign part of their consultancy assignments to students to be used as their project or thesis work. This way the lecturers would become more involved and personally interested to assist the students to produce better write-ups. This can assist students to be better researchers than they have been.

5.1.5 Some Urgent Requirements

The research revealed that the academic departments of the School need good and modern equipment and laboratories for instructions. The Applied Engineering

Science Department needs laboratories for each of the following subject areas:

i. Mechanics of Machines

ii. Strength of Materials

iii. Themofluid Mechanics

At the moment there is only one laboratory which accommodates all the three different practical subject areas.

The Mineral Technology Department also requires two laboratories, instead of one, to take care of

i. Mineral Processing and

ii. Materials Engineering

It is recommended that separate laboratories for these identified practical subject areas be created for the affected departments.

A lot of the academic staff have also indicated that they wish to be provided with very well furnished offices and computers with internet access. The School is enjoined to purchase more relevant equipment for instructions and to create additional reading rooms for both staff and students because it has a library with very little space. This time when a lot of physical developments are going on is an opportune one to add up these requirements because they require the creation of space.

5.1.6 Continuing Education and Award of a Higher Degree

For the School to continue to produce good products it is necessary to revive the Staff and Curriculum Development and Continuing Education Programme which

fizzled out because of lack of funds. Because of the immense importance of this programme the administration can set up a special fund into which a percentage of the consultancy fees can be put to run and sustain it. The Continuing Education Programme is needed to review programmes, course structures and syllabi more regularly and to assist to weigh their relevance. This is one good way to attract clients (students and organisations) and capture the market.

As it continues to review its programmes, the School should have a second look at its master's programme which is now run on a modular basis. This way of imparting knowledge is very convenient to serving officers in the mining and allied industry. The employee does not have to resign his job to take up schooling on fulltime for two years because on return his job would have been taken over by an equally qualified unemployed graduate. Within three years, he writes examinations in the required modules and presents a thesis write up for the award of a second degree.

The top executive of one of the mining organisations which assessed the School expressed a lot of reservation about the dangers which might result from the seemingly short cutting method of acquiring master's degrees.

The entry requirements allow for diploma holders in the relevant fields who have a minimum of five years post-qualification experience to enrol for the master's programme. As a result of this provision over 95% of those who have so far participated in the master's programme are diploma holders. The comment of the said top executive is that the knowledge gaps between he diploma, the first degree

and the post-graduate diploma may not all be filled up by the time such diploma products acquire their second degrees.

The recommendation here is that the authorities of the KNUSTSM, Tarkwa, should consider this concern, investigate and either substantiate or disprove it. This will dispel the fear which is likely to be carried by some more persons. Where the concerns expressed prove to be genuine, it would be necessary to make both the diploma and the degree holders who do not have the necessary background in Mining Engineering to take up some additional courses to fill up the gaps. An Advanced Diploma could be designed to bridge the gap. At the moment it is only holders of degrees and diplomas outside Mining Engineering who take some introductory courses in Mining Engineering. This does not affect diploma holders in mining or the related disciplines. Some study into this concern may be useful to maintain the confidence reposed in the master's programme.

5.1.7 Handling of Large Enrolments in the School

The problem with management of large enrolments in higher education is not only restricted to Ghana and for that matter the Third World. In the 1970s and 1980s, both the Labour and Conservative governments of Britain had a policy of expansion in higher education at lower unit cost. Conservative governments since 1979 had changed the funding mechanisms so that institutions in Britain have often enrolled more students without increasing the number of staff. The increase in staff : student ratios and mergers of some institutions put pressure on both staff and students in Britain.

Again, in North America and parts of Europe, large classes are the norm for much undergraduate work

There has been an increasing trend in the enrolment of fresh students into the higher education institutions in Ghana. Table 5.2 indicates the enrolments in the publicly funded universities in Ghana for a four-year period.

Table 5.2 **Enrolments in the five publicly funded universities in Ghana**

Academic Year	**1996/97**			**1997/98**			**1998/99**			**1999/00**		
Institution	**M**	**F**	**T**	**M**	**F**	**T**	**M**	**F**	**T**	**M**	**F**	**T**
U G	5853	2642	8495	6383	2223	8606	6986	2953	9939	8290	3617	11907
KNUST	4791	1288	6079	5496	1380	6876	6843	1730	8573	7489	2012	9501
U C C	3904	1438	5342	5341	1923	7264	5821	2061	7882	6154	2091	8245
U C E W	2223	732	2955	2597	957	3554	3155	1450	7605	4090	1852	5942
U D S	222	33	255	332	52	384	430	72	502	535	91	626
Total	**16993**	**6133**	**23126**	**20149**	**6535**	**26684**	**23235**	**8266**	**31501**	**26558**	**9663**	**36221**

Source: National Council for Tertiary Education.

A cursory glance at the figures indicates that between 1997 and 2000, additional 13,095 were enrolled in the five publicly funded universities in Ghana. The NCTE estimates that with a projected 10% yearly increment, the current 36, 221 students in the publicly funded universities in Ghana (1999/2000) will increase to 50,888 in the 2002/2003 academic year.

For the 2000/2001 academic year, the Government has directed the universities to enrol a second batch of students to cater for the backlog of applicants waiting for admission.

The KNUSTSM, Tarkwa, will have its fair share of the numbers. From yearly enrolments of less than 200 students in the early 1980s, the School's enrolment in the 2000/2001 academic year stands at 618 and it is expected to increase subsequently.

Apart from the financial implications, the problem with large numbers has to do with teaching and assessment methods. These problems were seriously discussed at the Staff and Curriculum Development Programme organised at the School in 1997. Gibbs and Jenkins (1992) argue that radical changes in teaching and assessment methods are necessary if we are to maintain quality in learning in Higher Education.

To make teaching large numbers easier at the School it is recommended that lecturers employ more use of overhead projectors, video taped lecturers and more practical lessons. In the areas of assessment of large classes, it is recommended that lecturers set examination questions which require short but crisp answers. It would also be helpful if examiners lay more emphasis on group assignments and discussions also as a way of assessment.

5.1.8 Gender Equity at KNUSTSM, Tarkwa

The Policy Objectives of the Reforms to the Tertiary Education System in Ghana aim at achieving 50% female enrolment in the tertiary education institutions in Ghana. Whereas some universities have attained up to 30% female enrolment at some point in time this study has shown that at KNUSTSM, Tarkwa, not even 5% has been achieved in any one academic year.

It is recommended that the School embark upon female enrolment drive. It may be necessary for the School to consider admitting all female applicants who possess the barest minimum entry requirements but which may not be as competitive as those of their male counterparts.

Sometimes the number of female applicants for the Mining Engineering and the allied programmes are just not enough. This particular problem necessitated the need, in 1997, for the Wassa West District Directorate of Education to organise a Guidance and Counselling Clinic for the Senior Secondary School Students in the District. The resource person who happened to be the researcher hammered seriously on this problem of female enrolment at KNUSTSM, Tarkwa, and encouraged the females to be very serious with the science subjects and to consider opting for Mining Engineering and the allied disciplines. It would be necessary for more of such workshops to be organised every year. With an FM Station at the School the channel of communication is more open now than before. More discussions should be organised on the usefulness of Science and Engineering and the contributions women can make to the economy. It is proposed also that the School offers bursaries to its female students as a way of encouraging and promoting female education in Mining Engineering and the allied disciplines.

It is also recommended that the one female degree graduate who is working with one of the mining companies and the few female diploma holders be used as role models for the female SSS students around the district and beyond. The School's Public Relations outfit can be charged to do more on this.

Some advertisements in both the electronic and print media can be made with the aim of stressing the need for and encouraging female applicants to enrol for Mining Engineering and related disciplines. These can whip up the enthusiasm of more females in the country to go into these disciplines.

5.1.9 Supplementary Funding Mechanisms

As enrolments continue to mount a very debilitating experience that most higher education institutions face is that of funding. Whereas the institutions continue to hammer on the problem at several fora, the government echoes its over stretched budget on education. As much as 30% or more of the national budget is devoted to education, a greater part of which is expended on higher education.

Recognising teaching as a major activity of the institutions the Tertiary Education Rationalisation Policy stipulated that the most effective method of funding tertiary institutions is to relate funding (that is government grants) to student numbers.

The NCTE envisaged that in the medium term period (1999-2003) and by the MTEF budgeting system, the annual financial allocation to the universities shall be 70% of their requirements. Yet by the fifth month of 1999, the KNUSTSM, Tarkwa, had seriously been under funded such that an urgent appeal for redress was communicated to the sector minister (appendix 3). The financial problem has persisted todate.

It would thus seem that the KNUSTSM, Tarkwa, has become a 'highly indebted poor' School and therefore it would need heavy doses of 'external' inflows to become sufficient.

It is recommended that the School source other means of getting funds to supplement the ever-existing financial difficulties. It may be necessary to commercialise the following areas of operation:

i. The Carpentry Shop
ii. The Welding Shop
iii. The Machine Shop
iv. The Electrical Shop
v. The Automobile Shop

Currently these service units are used to maintain school facilities and undertake some commercial activities as and when the requests come from the general public. With machines which are superior to those of other shops in the District, the School can attract a lot of customers and compete with most private shops in the District which are engaged in electrical, mechanical, automobile and carpentry contracts. If well supervised and managed and with good advertisements, these units can become profitable production sections of the School.

It is recommended again that the School establish and go commercial on the following activities:

i. A good well stocked bookshop. Since the Wassa West District lacks an excellent bookshop the School should consider trading in stationery and books even outside the Sciences and Engineering.

ii. A building construction company under the directorship of the School's own newly appointed Assistant Maintenance Engineer. Again with the expertise and experience of some of the staff around, the company can push away a lot of competitors. This may call for advertisements and exhibition of some of its products to the consuming public. These will bring in some needed funds to supplement the School's activities.

It is recommended further that the following units/sections of the School be privatised:

i. The Transport Section

ii. Maintenance Unit

iii. Grounds and Gardens Unit

iv. Security Section

A good number of workers are in these units whose productivity is much lower than is expected. It would be more cost effective to keep them as private units to which the School can pay for their services rather than maintaining the whole staff, pay their salaries, social security contributions and foot their medical bills together with those of their dependants and subsidise the education of their children and wards.

The School can also consider letting out its hostel facilities to independent organisations to manage. The School pays over ¢15 million monthly on water and

electricity bills for the hostels only. The residential user fee has not been revised since its introduction. Utility bills will be increased by 100% effective May 2001, and so it is going to incur more cost to run the hostels. Meanwhile government has not honoured a greater percentage of the grants on items 2 and 3 (MTEF System) to the School since January 1999.

It would be prudent, however, for the hostel management to seek the approval of the School after discussions with the stakeholders, before increases in hostel fees are effected.

In seeking the opinions of the University administrators on funding both the Vice Chancellor and the Registrar believe that commercialisation and privatisation of some of the activities of the School would not divert its attention from its primary objectives. The Director of the IMME is of like thinking so far as these extra activities are done in the proper manner.

It is also recommended that the School consider running sandwich courses and full time vacation programmes outside the University approved ones. This will yield three fold advantages.

First, the fees charged can earn the School some useful financial supplement. Secondly, it will offer opportunity for those who may not have access to regular university programmes to acquire knowledge and skills and enhance its capacity to offer services to the country. Thirdly the School's facilities will be put to more economic use. Teaching and examinations are done in 32 weeks in the year in all

universities in Ghana. The remaining 20 weeks are very much under-utilised. It has also been estimated that facility utilisation in most universities in Ghana during semester time is only 50%. The School will, therefore, enjoy economies of scale on the use of its facilities.

5.1.10 Remuneration as Motivation to Attract Staff

The study has revealed that the major reason why most brainy graduates do not take up lecturing at the School is that of poor remuneration. In some of the mining companies, the salaries of workers are aligned to the equivalences of some stronger foreign currencies whereas the university staff continue to receive pittances.

The staff who have spent time long enough in the university have done so with a lot of grumbling and dissatisfaction and this has affected their output. A lot of attention is diverted elsewhere by many academic staff in particular for extra income sometimes at the expense of useful service to the School.

Since salaries continue to be very low, it is recommended that about 5% more of the gross consultancy remunerations be set aside into a common pool. This can be shared as allowances for the academic staff whose areas of specialisation do not attract consultancies as well as the administrative staff in management positions. Some of the proceeds of the units, which have been recommended to be commercialised or privatised, can also be put into this special fund.

When the salaries of academic staff of the School become higher than those pertaining in other universities it will be possible to attract some of the young and bright students to take up lecturing.

It should be noted that the average age of the academic staff of the KNUSTSM, Tarkwa is 48 years. This is higher than the proposition of Addae-Mensah (1999) which pegs the ideal age at 45 years or below. Should the School fail to attract more young lecturers, its academic programmes will suffer with time, as the School may not be able to replace those due for retirement. This has started showing in two departments already. These are the Applied Engineering Science and the Geology/Survey Departments.

5.1.11 **Diverse Programmes**

There is some insecurity in the mining industry. The recent world developments in the industry, including falling prices of precious minerals, has affected Ghana such that some mines have collapsed while others are on the brink of closing down. The attraction to read Mining Engineering and the allied disciplines can fade away with time.

It is recommended that the School consider these developments and as well offer programmes in disciplines other than mining engineering. Some of such areas can be:

i. Management Science
ii. Computer Science and Applications
iii. Computer Engineering

The focus of the School needs to be diverse rather than narrowing in to one area which may not last very long.

5.2 Conclusion

This research work was aimed at evaluating the KNUSTSM, Tarkwa with an assumption that it had not performed well since its elevation to a tertiary status. The hypothesis has been disproved. Most of the assessment indicators have pointed to a positive direction. In all three major aims of the university, teaching, research and extension services (usually in the form of consultancies), the study has scored positive for the School.

It has contributed immensely towards the manpower development of Ghana. The data indicates that about 1,006 engineers have been trained in Mining Engineering and related disciplines between 1982 and 2000. These exclude the numbers which have been trained in craft practices and technician programmes. The School has also rendered, and continues to offer, very useful services to people and organisations both within and outside the Wassa West District.

The School, however, needs to be more efficient and effective in managing its resources. Certain factors naturally go against it which need to be addressed.

Venkata (1994) has stated that 'it is high time we realised that efficient administrative management has high correlation to efficient academic performance.' An important ingredient in management efficiency is the judicious use of resources, particularly finance.

The KNUSTSM, Tarkwa, is on a campus some 280 kilometres away from the main University campus. This makes administration very difficult. Most of the managers

travel frequently outside Tarkwa for meetings and consultations. It has been estimated that staff of the School travel about 2,000 man-hours yearly outside Tarkwa. The result of this is that the School looses heavily in money and effective productivity. When it becomes a University College, a lot of such man hours which are lost in travelling and which result in heavy expenditures will be curtailed. This way part of the School's financial difficulties will be wiped off.

Another important aspect of management efficiency relates to administrative structure and the reporting system. The KNUSTSM, Tarkwa, even though situated at Tarkwa, is a component of the IMME. This makes both the organisation structure and the channels of communication tall. A lot of things get duplicated at Tarkwa before they are sent to Kumasi for finalisation. They include appointments and promotions, approval of examination results, physical developments and student administration among others. Rather to its detriment, the huge expenditures which go with these practices are not considered by government in the allocation of subvention to the School. On becoming a University College a lot of these administrative procedures will be shortened and will save the School some heavy expenditures.

A lot of the School's products are in very sensitive positions in various organisations. It may be very useful to conduct a separate scientific study to confirm the numbers and the percentages of such persons who occupy managerial and top level positions both in mining and non-mining organisations, public or private.

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APPENDICES

APPENDIX 1

EVALUATION OF THE PERFORMANCE OF KNUST SCHOOL OF MINES, TARKWA

APPENDIX 1 A

Questionnaire for Students

This questionnaire will assist the researcher to make an objective assessment of KNUST School of Mines, Tarkwa, after 25 years of existence. The exercise is basically academic and your answers will be treated with the utmost confidence that it deserves. Your maximum co-operation is highly anticipated.

1. Sex of respondent (tick as appropriate)
   - Male [ ]
   - Female [ ]

2. Age of respondent
   - 20 or below [ ]
   - 21 – 25 [ ]
   - 26 – 30 [ ]
   - 31 – 35 [ ]
   - 40 or above [ ]

3. Formal education already attained (tick as appropriate)
   - SSS [ ]
   - A/L [ ]
   - Diploma [ ]
   - BSc [ ]
   - MSc/Phil [ ]

   Other (specify) .....

4. Do you feel comfortable with the number of equipment in the laboratories as against the number of students in your class that attend practical lessons? (Please tick as appropriate).
   - Yes [ ]
   - No [ ]
   - Not always [ ]. If no, go to (5)

5. Explain briefly the extent of inconvenience you experience during practical lessons.
   .....
6. Do the equipment in the laboratories function properly to serve your practical needs?
   - Yes [ ]
   - No [ ]
   - Not always [ ].if no, go to (7)

7. Explain the difficulties and how they impact on your practical lessons
   .....
8. The School has provided a reading room to supplement the library facilities. Does that solve the library problem of insufficient space?
   Yes [ ]
   No [ ]
   Somehow [ ]

9. Does the library provide enough books, periodicals and relevant material for your specific field of study?
   Yes [ ]
   No [ ]
   Not always [ ]

10. Do you have the maximum service of the staff during your visits to the library?
    Yes [ ]
    No [ ]
    Not always [ ]

11. Give a brief description of the various problems you encounter at the library.
    (A problem on each line)
    a.....
    b.....
    c.....
    d.....
    e.....

12. Do the majority of instructors attend lectures regularly?
    Yes [ ]
    No [ ]
    Not always [ ]

13. How about punctuality?
    Yes [ ]
    No [ ]
    Not always [ ]

14. Have you ever had an opportunity of getting attached to industry?
    Yes [ ]
    No [ ]

15. If (14) is yes state how often and its effects on your studies
    .....
    .....

16. If (14) is no, state the effect this has had on your academic work
    .....
    .....

17. What proportion of the number of you lecturers use teaching aids when teaching you? (tick)
    - 50% [ ]
    - 30% - 50% [ ]
    - 30% and below [ ]

18. Do lecturers provide lecture material (notes) for teaching?
    - Yes [ ]
    - No [ ]
    - Occasionally [ ]

19. Do the lecturers organise tutorials on all the subjects you offer?
    - Yes [ ]
    - No [ ]. If yes go to (20)

20. How useful are the tutorials? Specify.
    .....
    .....

21. Do you have the opportunity of assessing your lecturers at the end of the semester?
    - Yes [ ]
    - No [ ]
    - Sometimes [ ]

22. Have you ever been involved in a research work with any of your lecturers?
    - Yes [ ]
    - No [ ].

23. Of what importance are the general study courses to your engineering programme?
    .....
    .....

24. How would your current programme impact on your future career?
    .....
    .....

APPENDIX 1 B

Questionnaire for lecturers

1. Please indicate your department in the School.
   - Mining Engineering [ ]
   - Geology/Survey [ ]
   - Applied Engineering Science [ ]
   - Mineral Technology [ ]

2. To what extent do you see the relevance of the programmes of your department to the job market (Mining Industry)
   - Very relevant [ ]
   - Relevant [ ]
   - Not too relevant [ ]

3. How easy has it been for the former students (from your department) to acquire jobs after schooling?

   (a) In the past
   - Very easy [ ]
   - Easy [ ]
   - Not very easy [ ]
   - Not easy at all [ ]

   (b) Currently
   - Very easy [ ]
   - Easy [ ]
   - Not very easy [ ]
   - Not easy at all [ ]

4. What possible solutions can you suggest to mitigate the difficulties attendant with students' practical attachment programmes?

   .....
   .....

5. Has the School of Mines, Kumasi, been of any support to you personally in your work as a lecturer?
   - Yes [ ]
   - No [ ]
   - Quite [ ]

6. Please explain your answer to Q5.

   .....
   .....

7. Are there any difficulties in your department which affect your performance as an instructor? (Please specify if any)

   .....
   .....

8. Has the School been supportive in providing you with teaching materials? Explain
   .....
   .....

9. You service departments other than your own and your department is serviced by lecturers from other departments. Do you consider this development helpful or not?
   Helpful (explain) .....
   .....

   Not helpful (explain) .....
   .....

10. Have you had any publications since your appointment?
    Yes [ ]
    No [ ] if yes go to (Q.11)

11. Please indicate titles, dates of publication (if any) and publishers (where applicable)
    .....
    .....

12. Have you served the community (local e.g. Wassa West District or National) in any way?
    Yes [ ]
    No [ ]

13. If (Q.12) is yes, please state the ways in which you have offered service to the community (e.g. as Chairman or member of any local or national organisation). Please indicate the name of the organisation/committee and briefly describe your contribution
    .....
    .....

14. Have you done any consultancy work for the local, national or international community?
    Yes [ ]
    No [ ] if yes go to (Q.15)

15. Can you specify the nature of work, clients and the period of your service?
    .....
    .....

16. Has the School assisted you to acquire scholarship for further studies since your appointment?
    Yes [ ]
    No [ ] if yes go to (Q.17)

17. (a) Specify level of new qualification acquired .....

    (c) Name institution of further training and period of further training
    .....
    .....

18. How would you wish your department to be like in the next 5 years

.....
.....

19. Has the School lived up to its objectives? (Explain).

.....
.....

20. What suggestions can you offer to make the School a centre of excellence?

.....
.....

21. Suggest ways by which you can be motivated to perform better as a lecturer.

.....
.....

APPENDIX 1 C

Question Guide for the Principal

1. What had been the School's achievements before you assumed the position of Principal? .....
   .....

2. What else have been the achievements after you assumed duty?

   ....
   .....

3. To what extent have heads of departments of the School assisted you to make your achievements as a Principal? Specify.
   .....
   .....

4. What frustrations have you had on the job?

   .....
   .....

5. What has been the Senior Members' contribution in the area of research?
   .....
   .....

6. Has the staff done well in the area of extension services (consultancy, membership of committees outside the School etc.)?
   .....

7. Have you been able to put measures in place to improve the following in the School?
   (a) Teaching, (specify) .....
   .....
   .....

   (b) Research (specify).....
   .....
   (c.) Extension services (specify).....
   .....

8. There are plans to make the School a University College. What advantages do the School stand to gain from this?
   .....
   .....

9. What do you anticipate to be the problems from (8)?
   .....
   .....
   .....

10. Can you suggest as many ways as possible how the School can generate income on its own either to supplement government subvention or to make her financially independent.

    .....
    .....
    .....
    .....

11. Can waste be eliminated from the system?

    Yes [ ]
    No [ ]

12. If (11) is yes, please suggest ways by which this could be done.

    .....
    .....
    .....
    .....

13. What visions have you for the School before the end of your tenure of office?

    .....
    .....

APPENDIX 1 D

Question Guide for Heads of Departments of the School

1. What is your vision for your department for the next 5 years?
   .....
   .....

2. Enumerate the problems which face the School which hinder progress in academic work in your department
   ....
   .....

3. To what extent do co-operation and collaboration with other academic departments of the School either help your own department or hinder its progress

   Enhance progress .....

   .....
   Hinder progress.....
   .....

4. Have you and your staff done much in the area of research?
   Yes [ ]
   No [ ]
   Not Quite [ ]

5. . Please explain your answer to Q.4
.....
.....
6. Have you and your staff done much in extension services?
   Yes [ ]
   No [ ]
   Not Quite [ ]

7. Please explain your answer to Q.6.
   .....
   .....

8. Considering the number of students you have admitted over the years, could you have admitted more?
   Yes [ ]
   No [ ] if yes, go to (Q.9)

9. What factors have inhibited you from admitting more students into your department?
   .....
   .....

APPENDIX 1 E

Question Guide for Top University Administrators

(Vice Chancellor/Registrar, Director, IMME)

1. There are proposals to convert the School of Mines, Tarkwa, into a University College. Do you agree with the proposal?

2. If yes why? .....
.....

3. If no, why not?
.....
.....

4. The School has relied almost entirely on government subvention for its running. Do you think that this should continue indefinitely?
   Yes [ ]
   No [ ]. If no, go to (5)

5. Would you support privatisation of support services or you would go in for their commercialisation? Explain
   .....
   .....

6. Do you think that privatisation or commercialisation can affect the University's primary objectives?
   Yes [ ]
   No [ ]

7. If (6) is yes, please explain your answer
   .....
   .....

8. How has the KNUST School of Mines, Tarkwa, been able to live up to its objectives as a training institution in mining and allied disciplines?
   .....
   .....

9. Has the School the right calibre of staff for training students?
   Yes [ ]
   No [ ]

10. Are you satisfied with the programmes being run by the School? (Explain)
    .....
    .....

11. If (Q.10) is no, what suggestions do you have for improvement?
    .....
    .....

APPENDIX 1 F

Question Guide for District Assembly officials, Heads of Departments, and Agencies

1. Has the School of Mines, Tarkwa, ever assisted your department?
   Yes [ ]
   No [ ]
   Not quite [ ]

2. If (1) is yes, please specify
   .....
   .....

3. If (1) is no, please state how you think the School could be of much benefit to your department and to the Wassa West community.
   .....
   .....

4. Please make your general assessment of the School
   (a) Positive Aspects
   .....
   .....

   (b) Negative Aspects
   .....
   .....

APPENDIX 2

MEMBERSHIP OF BOARDS AND COMMITTEES OF THE SCHOOL

Appendix 2A

SCHOOL BOARD

Principal - Chairman
Vice Principal
School Secretary
Heads of Departments
Professors and Associate Professors
One member elected from each Academic Department
School Librarian
Other persons elected by the Board:
- School Training Officer
- School Examination Officer
- Departmental Examination Officers

Appendix 2B

APPOINTMENTS/PROMOTIONS COMMITTEE (Senior Staff)

Principal - Chairman
Vice Principal
School Secretary
Head of Department concerned
Librarian
Co-opted:
- School Accountant
- Chief Auditing Assistant

Appendix 2C

APPOINTMENTS/PROMOTIONS COMMITTEE (Junior Staff)

Principal Chairman
Vice Principal
School Secretary
Head of Department concerned
Librarian
Co-opted:
- School Accountant
- Chief Auditing Assistant

Appendix 2D

DOMESTIC SERVICES COMMITTEE

Principal - Chairman
Vice Principal
School Secretary
Hall Master
Accountant
Matron
Resident Engineer
2 Students
2 Members elected by convocation
2 Senior Staff
2 Junior Staff

Appendix 2E

ESTATE MANAGEMENT COMMITTEE

Vice Principal - Chairman
School Secretary
1 member each from
- UTAG
- FUSSAG
- TEWU

Co-opted: School Accountant

Appendix 2F

LIBRARY SERVICES COMMITTEE

Vice Principal Chairman
School Secretary
1 Member from each Academic Department
School Librarian
2 Students

Appendix 2G

RESIDENCE COMMITTEE

Principal — Chairman
Vice Principal
School Secretary
Hall Master
Senior Tutor
2 Hall Tutors
2 Members appointed by School Board
4 Students appointed by SRC

Appendix 2H

DEVELOPMENT AND PROJECTS COMMITTEE

Director of Works and Physical Development, Kumasi — Chairman
Principal
Vice Principal
School secretary
Resident Engineer
School Accountant
School Auditor
Contractors of projects concerned

Appendix 2I

COMPUTER SERVICES MANAGEMENT COMMITTEE

Vice Principal - Chairman
Head, Computer Section
School Secretary
1 Member from each Academic Department
1 student Representative

Appendix 2J

SCHOLARSHIPS AWARD COMMITTEE

Vice Principal — Chairman
School Secretary
1 Member from each Academic Department

Appendix 2K

PRIMARY SCHOOL MANAGEMENT COMMITTEE

Vice Principal - Chairman
School Secretary
PTA Chairman
1 Member each from - UTAG
- FUSSAG
- TEWU
1 Representative of Teachers of the School
District Director of Education/his representative
Co-opted: Accounts Officer, Primary School

Appendix 2L

HEALTH SERVICES MANAGEMENT COMMITTEE

Vice Principal - Chairman
School Secretary
Hall Master
One member each from - UTAG
- FUSSAG
- TEWU
Chief Nursing Officer
Representative of District Health Management Team
JCR Representative
Co-opted: School Health Inspector

APPENDIX 3

COPY

11th June 1999

The Honourable Minister of Education
Ministry of Education
P. O. Box M.45
Accra

Through:

The Executive Secretary
National Council for Tertiary Education
P. O. Box M.28
Accra.

Dear Sir,

INADEQUATE FUNDING OF UST SCHOOL OF MINES, TARKWA
THE NEED TO ARREST THE SITUATION

The low level of subvention to the School since the beginning of this year is creating financial problems that have adverse effect on academic work. It has therefore become necessary to bring to your notice the grim situation and to request that you assist in rectifying the situation as a matter of urgency.

ITEM 1: Personal Emolument

The School paid a total of ¢473,762,764.48 as Personal Emoluments (PE) to staff during the first quarter of the year 1999. This averaged ¢157,920,921.49 per month. Subvention received by the School to pay for PE totalled ¢417,130,326.54, averaging ¢139,043,442.18 per month. There was a short fall in funding of PE to the tune of ¢56,632,437.94 for the first quarter or ¢18,877,479.31 per month.

In the second quarter, specifically April and May, the School received ¢93 million and ¢104 million respectively instead of ¢157,920,921.49 per month for PE.

ITEMS 2 & 3: Other Recurrent Expenditures

From January, 1999 to May 1999, the School received ¢20 million per month to cover Item 2 (i.e. Administration Expenses). No money was received to pay for Item 3 (i.e Services Expenses). Against this background, the following basic costs should be covered monthly for the School to run effectively:

1. Utility Bills
2. Teaching Materials

3. Stationery
4. Transport Costs
5. Maintenance and Sanitation

The cost levels of these items are as follows:

2.1 **Utility Bills**

The School is billed by the Utility Companies in the following amounts:

Electricity	¢15.5 million per month
Water	¢5 million per month
Telephone	¢3 million per month
Total	¢23.5 million per month

The total amount per month as stated above is more than the subvention received from the Government per month for Item 2 (ie Administration) alone.

This has led to the situation where the bills are not paid and the School is constantly threatened with cuts in supply. The total amount owed by the school for utilities to date is ¢227 million. This is made up of:

- ¢127,711,056.00 for last year 1998; and
- ¢99,288,944.00 for this year.

It is regrettable to note that the arrears for last year have not been paid even though outstanding utility bills for 1998 have been paid to the main Universities.

2.2 Teaching Materials

The School uses the following critical materials for teaching and research:

- Chemicals and reagents
- Equipment consumables and accessories

Due to the low level of funding no acquisition in adequate quantities can be made. We are therefore reduced to buying small quantities on credit which are used purely for demonstration but no serious academic work. The indebtedness as a result of crediting these materials albeit in very small quantities stands at ¢97,954,762.97. In order to provide these materials in sufficient quantities to the academic departments, an amount of ¢25 million per month must be obtained.

2.3 **Stationery**

Stationery is used for academic and administrative work as well as examinations. Out of the ¢20 million per month received as subvention for Item 2 (i.e. Administration Expenses) a total of ¢9.5 million is spent on stationery every month. This amount represents 50% of the School's requirement for stationery per month. The situation where the need of stationery is not met makes teaching and administrative work very difficult.

2.4 **Travel and Transport**

The School is located 280 kilometres away from its main campus in Kumasi and 317 kilometres from Accra. This means that a lot of travelling has to be made to Kumasi to attend very important meetings on academic and administrative issues and to Accra to follow-up subventions and discussions on matters pertaining to the School's operations and to mining companies and industrial establishments for practical and other field work and to collect data for teaching. These travels involving senior management and academic staff of the School cost an average of ¢6.955 million per month. In addition to this, student field trips which constitute a vital aspect of the academic work cost an average of ¢10 million per month. The low subvention received for Item 2 (Administration) has meant that substantial part is spent on travel.

2.5 **Maintenance and Sanitation**

The School currently operates with vehicles and equipment, which were acquired over 10 years ago through donations from UNDP and others. These vehicles and equipment have passed their replacement period, and are being used with a lot of maintenance which is very expensive. In addition to the above, the buildings and other infrastructural facilities requiring serious rehabilitation are being kept serviceable through expensive maintenance due to lack of funds for any major rehabilitation. A total of ¢29.6 million per month is required to finance maintenance work and sanitation.

Summary

The School receives ¢20 million per month for Item 2 (Administration) which are in many cases delayed for its operation. No money for Item 3 (Services) has been received since January, 1999. The shortfalls of the required funding from January – May 1999 are as follows:

	Amount Required (¢)	Amount Received ¢)	Shortfall (¢)
Personal Emolument	785,000,000.00	615,068,405.28	169,931,594.72
Administration Expenses	417,950,101.63	80,065,118.21	337,884,983.42
Service Activity Expenses	152,324,685.00	0.00	152,324,685.00
Total	1,355,274,786.63	695,133,523.49	660,141,263.14

I am therefore requesting that you kindly take the necessary steps to provide sufficient subvention to enable the School run effectively.

Yours faithfully,

(Signed)
Prof. D. Mireku-Gyimah
Principal

cc: The Vice-Chancellor, UST, Kumasi
The Registrar, UST, Kumasi
The Finance Officer, UST, Kumasi