

Teacher Education: The Incubator of Science and Technology for Development in Africa

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Abstract

Teacher education is an important and exclusive programme of education. The programme deals with all issues pertaining to the teaching profession including the preparation and production of school teachers. The importance of teacher education programme lies in the latter role – preparation and production of teachers. Teachers are the basis and spur of development in society. They teach and train as well as equip individuals with the relevant competencies needed for development. Besides this role, the performance of its products (school teachers) is, directly or indirectly, the initiator and promoter of other essential aspects of education such as Science and Technology. The nature and scope of this programme facilitates the development of Science and Technology. But the combination of these two aspects of education provides a formidable inertia for the development of the society. This paper examines the role of these components of education in development in Africa. For convenience of presentation of the discussion, the paper is divided into six parts excluding introduction and conclusion. These are the purpose of teacher education programme in the society, the role of the programme in education and society, relationship between teacher education programme and Science and Technology for development in Africa, the facilitation of the relationship between the two aspects of education for development in Africa, potential challenges of the relations between teacher education programme and Science and Technology for development in Africa and, the future of these two programmes of education in development in Africa. This sort of approach of treatment successfully brings out the gist of the term – “Teacher education” as the incubator of Science and Technology for development in Africa.

Key Words: Teacher Education, Science, Technology, Development, Africa

Introduction

Teacher education is an important component of education. It is a programme of education that deals with all critical issues concerning teaching profession. Ordinarily, it is considered a programme that largely deals with preparation and production of the relationship school teachers for an established system of education in the society. According to Lucas (1968), teacher education is an essential programme that is mandated to initiate, develop and nurture the culture of the society. This is because the prepared and produced school teachers are normally equipped with specialised competences that they use to develop the society (Bosire, 1995). In this role, teacher education is said to be the custodian of society's culture. Since school teachers are transmitters of a people's culture (Ssekamwa, 1972).

The technical definition of teacher education does candidly and elaborately demonstrate the fundamental role of this programme. In technical terms, teacher education refers to the policies and procedures designed to equip prospective teachers with knowledge, attitudes, behaviour and skills they require to perform their tasks effectively in the classroom, school and community (<http://intl-j-te.sagepub.com>). This view of teacher education is the global position and is in agreement with that of Bosire (1995) who advocates for the need to equip school teachers with relevant competencies for teaching and national development (Ringa, 1992).

In order to prepare and produce competent crop of school teachers, teacher education programme involves the design and administration of proper strategies. The latter include the use relevant methods, skills, educational media and a variety of carefully selected experiential exposures. In other words, the prospective teachers are conducted through theoretical and practical tasks which are the bastions of innovations not only in teaching but also education in general. Hence, a quality teacher education programme aims at producing creative, innovative and initiative school teachers. These are individuals with the ability to create a productive society. In other words, a teacher education programme prepares school teachers who can utilize their competencies to facilitate the tapping development and utilization of talents in the society. This is the solid basis for meaningful development in society.

The use of appropriate techniques, media resources and critical thinking in teacher preparation programme, and by extension classroom teaching, generates interest and curiosity in the beneficiaries. Among the areas of interest that teacher education

programme develops in prospective/aspirant teachers is Science and Technology. This may not be explicit in basic teacher preparation programme may become so at higher levels of education. This is the thrust of this paper – teacher education programme as the incubator of Science and Technology. However, this development/potential is only realised when this programme is efficiently and effectively organized and conducted. In an attempt to demonstrate the potential of teacher education programme to lay the foundation for development and utilization of Science and Technology in development in Africa, the paper examines the purpose and role of teacher education in the society; the relationship between teacher education and Science and Technology for development in Africa; facilitation of the relationship between teacher education and Science and Technology for development in Africa; challenges of developing the relationship between Teacher education and Science and Technology for meaningful development in Africa and then, the future of Teacher education and Science and Technology for development in Africa.

Purpose of Teacher Education in the Society

As correctly pointed out by Ringa (1992) and Lucas (1968), teacher education programme designed and administered to prepare and produce school teachers. This process involves conducting properly identified and selected individuals through a well organized and conducted teacher education programme that has a suitable curriculum, highly motivated staff and proper environment. These are the basics in an efficient teacher preparation programme.

Secondly, teacher education is conducted as an avenue for creating and sustaining the desired culture of the society. The manner teacher-trainees are managed/prepared/handled while going through Teacher education programme determines the quality of society a nation wishes to create (Kafu, 2013). This is because teachers are the initiators and transmitters of the values of the society. The quality and adopted mode of preparing school teachers have strong bearing and the quality of school teachers who are expected to influence the level and rate of development in the society. This spirit is normally carried through the type of teacher education curriculum designed and followed, the administration of the programme and the quality of teacher-trainers who prepare and produce the required school teachers for an education system.

These normally determine the kind of competencies these school teachers are equipped with (Bosire, 1995).

Teacher education is also designed and administered to promote creativity and innovations in education in particular and the society in general (Lombardi, 2011). Teachers have long been considered as the incubators of the culture of the society. Although the teacher education curriculum and the behaviour of the teacher-educators, the desired culture is created and instilled in the teacher-trainees who, on qualification, do and transmit the same cultural values to the larger society through teaching and other related contacts. Hence creating and sustaining the culture of the society. More often than not, this process involves creating new ideas based on ideals of the society and adopting new values based in emerging developments in education and society. This situation does in the long run result in anticipated or even an unanticipated transformation of the society.

Transformation of individuals is the critical focus of development in a society. It involves adopting and adaption to new fashions of doing things and looking at the same. This development usually creates new perspectives (attitudes, skills, knowledge and orientations) and culture (values) in the society. Although this feature is intended to promote the existing cultural orientation, occasionally this may be a departure from the established practices. This is true when the scientific and technological culture is adopted (Jung-Wang, 2010). The latter normally comes with its new demands to the society which, in most cases, are traumatizing!

The last purpose of teacher education is exemplified by UNESCO -UNVOC (2001) that stresses the need for quality in teacher education and, by extension, Technical and Vocational Education and Training (TVET). The emphasis here is placed on the need to provide quality teacher education programme that will prepare and produce competent crop of school teachers. Once the latter cadre of personnel is available, there will always be insurance of creativity and innovation in education and society. This is because such teachers would have been initiating and implementing creativity and innovation in the education section. Consequently, the quality of teacher education does not only result in production of competent crop of school teachers but also promote the quality of education designed and provided in/to the society.

From the above discussion, it is now possible to examine the role of teacher education in the society.

Role of Teacher Education in Education and Society

For some time now, the role of the Teacher education in education and society has been sounded/recognized by educators (Shiundu & Omulando, 1992; Jung-Li, 2001). In the view of these scholars, this programme is the initiator incubator and promoter in innovations in education and society. It is the source of new ideas, skills/techniques, new ways of thinking and managing situations. Prospective teachers are usually prepared in a broad spectrum of these issues that they eventually apply in their future operations as qualified school teachers. These competencies are then utilized in promoting developments in the society or simply transform it. But the source of this initiative is the Teacher education programme.

Besides the above role, teacher education is crucial in sustaining the society's education and the culture. By preparing and producing the right calibre of school teachers, there is always an assurance that the designed and administered education system will be sustained. This is because such teachers will be able to interpret the curricula, inject new ideas, and implement as required, hence ensuring that the ideals and values of the society are not only fulfilled but continued. In this context, teacher education is a powerful tool in sustaining as well as reviewing the established system of education and the culture of the society. Through this process, teacher education programme is the most reliable programme developing innovations including Science and Technology for development in education and society. The discussion on relationship between teacher education and Science and Technology for development in Africa demonstrates this fact.

Main Discussion

Relationship between Teacher Education Programme and Science and Technology for Development in Africa

The relationship between teacher education programme and Science and Technology for development is an established fact (Jung-Li, 2001). The rapid developments in the countries of —Tigers of Asia are a typical demonstration of this

relationship. Until the late seventies, these countries (India, Malaysia, Singapore, Burma/Nymar) were poor, struggling third world nations. But they realized one trick to transformation and picked on it promotion of teacher education programme. They reviewed this programme to suit their development agenda, invested adequately in the programme and utilized the relationships between this programme and development of Science and Technology as a tool for national development.

Generally, the relationships between teacher education and Science and Technology is curricula, pedagogical, technical and logistical. In the case of curriculum is critical in preparing and producing the required crop of school teachers. Ideally, the curriculum for teacher education should be broad, balanced and relevant to the needs of the society the prospective teachers are supposed to serve. The preferred teachers should be creative and, innovative, skill and information-intensive and practical in nature. Greater emphasis should be placed on selection and use of appropriate education media. Finally, this curriculum should be designed, managed and implemented by professionals in teacher education. When all actions are taken, competent school teachers will be produced who have the capacity to initiate, development and instill scientific and technological attitudes in learners and the society in general.

However, in order to enhance the role of teacher education in developing Science Teacher education in school education and the society, there is need to select and use appropriate instructional materials for teacher preparation process. These items are not only carriers of basics of initiating scientific and technological information that teacher-trainees need but also main triggers of unique talents in them. Some of these talents include those of creativity, innovativeness and critical thinking. But for instructional materials to have impact on the preparation of required school teachers, they must be modern and relevant to the teacher preparation programme, adequate in supply and available in the desired variety. These features are likely to facilitate the prospective teachers to develop and acquire the creative and innovative skills and abilities that are basics in promoting Science and Technology. This development will have a multiplier effect when these teacher-trainees eventually qualify to serve in the schools and the society. As such, promoting the development of Science and Technology in learners and influencing the society to appreciate the value of this aspect

of education. Normally, when the right kind and type of instructional materials are used in teaching and training process, they lay a firm foundation for developing scientific and technological attitudes in individuals. This is because they are the genesis of Science and Technology through creation of curiosity, spirit of inquiry and interest in handling and manipulating objects according to established scientific laws.

Instructional process is largely pedagogical activity (Mayhew, 2006). It requires the use of specialised competencies that are professional, academic and logistical. These include the ability to gather, organise and deliver the required information to learners using properly selected educational media in a conducive environment. Teachers with such a background are most likely to be instrumental in initiating and developing scientific and technological attitudes and practice in learners. However, the focus of media-based instruction is to promote Science and Technology in education as specialised area. This will, in turn, facilitate the development/transformation of the society or even fact-track this process. Therefore, the emerging relationship between teacher education programme and Science and Technology is that both aspects of education focus on the development and/or transformation of the society. The latter is the long cherished dream in independent Africa.

From the above discussion, it is quite clear that both the teacher education programme and Science and Technology are closely inter-related and inter-dependent components of education. Both have their origin of education. In effect, they are educational out-fits. Their design and administration are pedagogical, technical and logistical. Lose out one, and the latter features; then none of them will exist. Further, the two – teacher education and Science and Technology – are inter-dependent. Without the former that prepares and produces school teachers, who are the brains behind the development of Science and Technology, this aspect of education may not be realized. In the same way, without Science and Technological advancements that produce modern educational technology being used in teacher education programme, there would be little modernization of this programme of education. Therefore two components of education need each other. Their relationship is like that of an egg and a chick.

The presented relationship teacher education and Science and Technology can be summarized thus: the former (Teacher education) is the incubator/genesis/originator

of Science and Technology; both components of education are resource – and skill-intensive activities; the two require specialised competencies; they focus on development or transformation of the society and the two are closely inter-related and inter-dependent aspects of education. However, the crucial concern at this stage is how the discussed relationship can be facilitated/nurtured for the benefit of development in Africa. The next section of the paper examines this concern.

Facilitation of the Relationship between Teacher Education and Science and Technology for Development in Africa

The foregoing discussion has clearly demonstrated that Teacher education is the genesis as well as incubator of the development of Science and Technology. In the relationship between these aspect of the education is reciprocal/ambiotic which augurs well for the development of the society. That is, these two components of education contribute more or less equally towards the development agenda of the society. However, for the said relationship to have some impact on the designed development/transformation of the society, especially in Africa, there must be increased facilitation as discussed below.

First facilitation strategy is that there must be clearly designed and administered political and educational policies governing the administration of teacher education programme and Science education and Science and Technology. These policies should be derived from the political and educational philosophies of the society which form the basis for designing and administering the two components of education. Normally, these are statements that express the aspirations of the society towards the need for launching and utilizing the two components of education in planned political programmes. Therefore, when there is strong political support in the form of policies regarding the development and administration of teacher education programme and Science and Technology, the discussed relationships will prosper and will definitely propel the desired development agenda. This is because these policies provide the framework through which the established programmes of education will be designed and administered. These policies will define what models of teacher education programme and Science and Technology to initiate, develop and eventually administer. Since Science and Technology is generic process that is derived from the type of teacher

education programme a country develops and conducts, it is important to discuss the model of this programme of education a country must adopt and/or adapt to.

The experience of the —Tigers of Asia¹ demonstrates the importance of Teacher education programme in national development (Jung-Li, 2001). This is a fact that Lucas (1968) recognized regarding the role of school teachers in the design and sustenance of education of education system. Since education is the major soft-ware in development, the better the quality of education and by extension Teacher education programme, the most likely the higher the level of development a society will experience. It was this realization that made the founding fathers of Africa (OAU Proceedings, 1963) called for greater investment in education. This view was later to be taken up by the —Tigers of Asia¹ which did actualize this ideal (Jung-Li, 2001). For the —Tigers of Asia¹ they went further by designing and adopting appropriate models of Teacher education programmes which they supported by investing adequately in them. This was after realizing that the quality of school teachers is the biggest trigger/stimulus for meaningful development including the development of Science and Technology. The rest of story regarding the development prospects of this region is there for anyone who cares to see or listen to. The governments' decision to strongly support teacher education programmes prepared the pad for these —Tigers of Asia¹ to launch Science and Technology that was, in turn, used to initiate, develop and accelerate the witnessed development in this region.

Related to the above are the preferred instructional technologies, that is, the way teaching and training processes are conducted. If there has to be meaningful development of Science and Technology in a country, school must be trained and encouraged to use modern and innovative instructional technologies that are intended to tap talents of learners and develop scientific and technological potential in them. This is only possible when teacher education programmes prepared and produce school teachers who are competent in utilizing the environment and other related educational media in instruction (Ofojebe & Chimelo, 2010). This is what Bosire (1995) emphasizes when talking about the required competencies by prospective teachers.

Another critical facilitation of the relation between teacher education programme and Science and Technology is the attitude of the society towards these two programmes of education. Generally, many people in Africa to-day tend to have negative attitude towards Teacher education and Science and technology programmes

perhaps because these two are not properly understood (Kafu, 2010), but is important to note that when people have positive attitude towards any development, this serves as a motivation and enhances its development. Today many African countries are giving leap service (support) to teacher education programmes and Science and Technology as demonstrated by insufficient investment and recognition. The focus in many countries to-day is on primary and secondary education sectors and not teacher education and Science and Technology yet these are the catalysts to national development. Little attention is paid to these two programmes of education that are critical components of development. This treatment of these aspects of education has given the public the impression that Teacher education programme and Science and Technology are not important. Perhaps this explains the widespread under-development in Africa.

Emerging developments in the society and education may also be impacting on the relationship between teacher education programme and Science and Technology. The rise of new and more lucrative careers, sophistication in lifestyles and the emergence of globalization process have impacted negatively on the development of teacher education programme and Science and Technology. If Africa has to enjoy and participate in scientific and technological developments, teacher education programme must be modernized by adopting and/or adapting the new education technologies and increasing investment in it for the purpose of developing relevant facilities and resources. Such a strategy will definitely promote the relationship between Teacher education programme and Science and Technology and then between these two and development in Africa.

But all the above discussed issues regarding relationship between teacher education programme and Science and Technology for development in Africa and how this process should be nurtured face unique challenges. The solution to these challenges will pave way for competitive development in this continent.

Challenges of the Relationship between Teacher Education and Science and Technology for Development in Africa

This section of the paper focuses on emerging issues and problems regarding the establishment of relationship between teacher education programme and Science and Technology that could foster development in Africa. There are many challenges facing

this effort but this paper examines only four of these. Any attempt to develop and forge the desirable relationship must take cognizance of these challenges.

As already pointed out above, the general attitude towards Teacher education programme in Africa has changed for the worse. While a few decades ago this was a respected programme of education in Africa, to-day it is most despised sector of education. Many of prospective teachers end up in this programme as the last resort and most of them do so for employment purpose and NOT as a vocation/call (Kafu, 2009).

This development is impacting negatively on the development of Science and Technology because Teacher education programme is producing school teachers who are not committed and motivated. Hence the crop of school teachers out there are not creative and innovative enough, the two pre-requisites of development and nurturing of Science and Technology in the society.

The other related challenge is the attitude of African governments towards teacher education programme as demonstrated by the level of investment in the programme. The investment in this programme can best be characterized as meagre. This is inadequate to support development of innovations in the programme that are essential for initiating and developing the basis for Science and Technology. Funding is low and more often than not erratic in disbursement. This has an impact on the development of the required facilities and resources for modernizing the programme to meet the global expectation. Therefore, there is increased need to enhance the level of investment in teacher education programme so as to support its transformation for development of Science and Technology and general development in Africa.

The emerging controversies in Teacher education programme is a worrying trend (Kafu, 2013). In the past, this programme was, presumably, understood and its role in education and society was appreciated. The society knew who should prepare school teachers, how these teachers should prepare and where teacher preparation exercise should be conducted. Today many academic/intellectual questions are being raised, specifically who should train teachers and where should these teachers be trained. To a seasoned professional in teacher education, these are unnecessary questions. But they beg for re-examination of the programme, especially its professional status. Further, some of those individuals raising these questions need to be educated on this programme while others are doing so because of the influence of the surging,

modern technological advancements and also for commercial reasons. Therefore, there is need for the teacher education to assert itself as an important tool in the development of Science and Technology and transformation of the society. This should be done through development of innovations and responding appropriately to the emerging developments in education and society.

The last challenge to the establishment of relationship between teacher education programme and Science and Technology for development is the rapid developments in education and society. Among these developments are increased demand for education that has resulted in increased enrolment in education sector and need for more school teachers; the increased level of literacy and hence sophistication in the society that is calling for development for new, modern and relevant competencies in the beneficiaries of education; the changing attitude towards education demonstrated by the character of learners and lucrative careers in the world of work that are luring away potential, prospective teachers. All these issues are potential, real challenges to teacher education programme and Science and Technology. They must be recognized and appropriately addressed. However, all is not lost for the future of teacher education programme and Science and Technology for development in Africa.

The Future of Teacher Education and Science and Technology for Development in Africa

The determining factors for the future of teacher education and Science and Technology in development programmes for Africa include changing the attitude of the African society towards education programmes and Science and Technology to fast-track development; developing and implementing clear philosophies of education, teacher education and Science and Technology; reviewing the existing teacher education programme with a view of promoting Science and Technology for development in Africa; the level of investments both in teacher education programme and Science and Technology; technologisation of education and teacher education programme in particular to pave way for globalization of education in Africa and the emerging, critical development needs in the society. These are important factors in determining the future development and role of teacher education and Science and Technology in development agenda of the African continent. These factors must be

identified, carefully isolated and seriously utilize teacher education and Science and Technology for global, competitive development. Africa has no option but to turn to teacher education and Science and Technology if it has to assert itself on the international development platform the way —Tigers of Asial has done.

Conclusion

This paper has established three important facts concerning teacher education programme and Science and Technology for development in Africa. From the discussion, teacher education programme is the initiator, incubator and nurture of Science and Technology that the basis of industrialization process in particular and general development in Africa. The second established fact is that there is strong relationship between teacher education programme, Science and Technology and general development in the society. If this relationship is nurtured and harnessed properly, it can accelerate development Africa since this relationship is real and symbiotic. Finally, it has been demonstrated the quality of teacher education is a great determinant of the development of Science and Technology and development in Africa. The quality of school teachers is established basis of development in the society (Okumbe, 2001; Lucas, 1968). Teachers spur development and are instrumental in transforming societies.

On the basis of the preceding discussion, the future of teacher education programme and Science and Technology for development in Africa is one of hope. The precedent provided by the —Tigers of Asial is a source of inspiration in utilization of teacher education programme and Science and Technology for development of this continent. All that is required is to address the issues raised in the discussion concerning the concepts of teacher education Science and Technology and development; relationship between teacher education programme and Science and Technology and the real and anticipated challenges of the relationship between these two components of education and the related impact on development in Africa.

References

- Bosire, E. S. (1995). *Proposals for the Improvement of Training Teachers of English for Primary Schools in Kenya* (Unpublished M.Phil thesis). Eldoret, Moi University
- Jung-Li, W. (2001). *Teacher Education and Development in the "Tigers of Asia" Region*. New Delhi: Prabhai Publishing Co. Ltd.
- Jung-Wang, T. (2010). *Education for Development. The Experience of the For East Asia*. Mumbai. Gurbai Co. Ltd.
- Kafu, P. A. (2013). Raging Controversy in the Teacher Education programme. The issue of who should prepare and how should school teachers be prepared (forth coming). *DETA Journal of Distance Education*, 8 (14), Pretoria.
- Lombardi M. J., (2011). *Measuring oil price over-and undershooting*, mimeo, European Central Bank.
- Lucas, E. (1968). Teacher Training and Development in East Africa. *Makererean Number*, 8. Kampala.
- Mayhew, R. (2006). *The importance of Training and Educating Employees*. Retrieved September 10, 2013 from <http://www.ehow.com/infor-7752602-importance-training-educating-employees>.
- OAU(1963) Charter of the Organization of African Unity (OAU). Addis Ababa, Ethiopia.
- Ofojebe, W. N. & Chimelo, E. T. (2010). Teachers Innovation and its Influence: A quality Assurance in the Nigerian Education System. *Africa Research Review. An International Multi-Disciplinary journal*, Ethiopia, 4(2).
- Okumbe, J.A. (2001). *Human Resources Management: An Educational Perspective*. Nairobi: Educational Development and Research Bureau.
- Ringa, M. K. (1992). *A Study of Organisation and Management of Teaching Practice in Kenya: A Case of Moi and Kenyatta Universities* (Unpublished M.Phil. thesis). Eldoret. Moi University.
- Siundu, J. & Omulando, J. (1992). *Curriculum: Theory and practice in Kenya*. Nairobi: Oxford.
- Ssekamwa, J. (1972). *History of Education in East Africa*. Nairobi: Longman.
- UNESCO-UNVOC (2001). International Conference. *National Strategy for Developing Human Resources through Technical and Vocational Education and Training*. Korean Commission for UNESCO, UNESCO International Centre for Technical and Vocational Education and Training, Bonn.