

## Forestry Education in Africa: A Review of the Teaching and Learning Styles for Sustainable Forest Management

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### **Abstract**

*Forestry profession in the twenty-first century will not be immune to complex challenges that currently stare several sectors if it does not swiftly adapt to the changing globalized trend. Professional milieu in the subsector could be requiring a lifelong learning, greatly developed critical thinking ability with well-honed communication skills to break even: attributes already considered by employers to be deficient in prospective forestry employees. As an attempt towards envisioning into a robust and composite education for upcoming forestry professionals, the researchers reviewed training modules that promote learner-based mastery, retention of content knowledge and the development of higher order process skills to meet likely anticipated goals. The researchers investigated and applied the above in the course: Forestry Extension, Education and Development offered at Federal University of Technology Owerri, Nigeria. The study focused on training modules whose defined objective is development of active learning strategies with broadened spectrum of content-specific synopsis that engage trainees with case studies, demonstrable online-based access/links and brainstorming. The above were to test capacity of trainees in handling forestry and wildlife resources-based challenges and emergences to demonstrate how concepts and sustainable management principles can be applied to solve complex problems with multiple stakeholders. By offering trainees links to needed information, periodic evaluations and hands-on scenarios in relevant contexts, the researchers observed (also as evidenced from cognitive psychology) that learner-based interactive education, hands-on tips and access to needed platforms for self-enquiry facilitated trainee innovative discoveries and aptitude in various need-based areas of forestry management. It was recommended that a build-in of appropriate motivationally cognate hands-on themes into forestry curriculum and adoption of innovative learner-based pedagogies in forestry education should be vigorously pursued to better prepare prospective foresters for cutting-edge learning. This will in mid and long term range translate into development-based partnerships among wide spectrum of need-based stakeholders in and across sectoral leanings.*

**Key Words:** Content-specific, Case-studies, Envisioning, Interactive, Stakeholders,

### **Introduction**

The boundaries that define forestry are expanding rapidly given on the one hand the complexity of resources that need sustainable management and more especially, on the other hand, the entrance into the profession of persons from sister disciplines (FAO, 1994; Innes, 2010). Again, conventional sustained-yield approaches that focus on commodity production are gradually giving way to comprehensive and integrated approaches that emphasize sustainability considerations, robust experiences among practitioners as well as partnership considerations are disturbing issues of concern. These altogether are potential agenda that would make planners and managers of forestry discipline and profession to engage in almost ceaseless reviews of forestry training curriculum in the light of these challenging experiences.

Given these disturbing scenarios, in a bid to catch up with development trends especially having to favourably compete with other disciplines and sub-sectors, forestry graduates must be broadly educated to possess requisite skills and expertise in breadth and in depth (Temu and Kasolo, 2001; Kostilainen, 2005). More so, in response to the proposed comprehensive and integrated approaches to natural resources management, there is needful call to find the means by which focused education, interdisciplinary systems thinking, and communication skills can be developed and applied in and by forestry professionals. In other words, in attaining these clarion calls in which sustainable forest management SFM is a single aspect of the thesis, formal education in forestry cannot be an outlier. Hence, such a lofty goal and dream can largely be derived from planned educational processes (Paava and Schuck, 2006).

### **Historical and Experiential Framing**

Many forestry courses across different educational institutions worldwide have not changed greatly in decades and some still resemble an Oxford syllabus of which Sisam (1964) as early as around mid 1960s then gauged to be over a century old. In the submission of Howe (2004), forestry course consists of the following: the formation and properties of soil; elements of physics, chemistry and biology; systematic botany with special reference to trees and shrubs; the economics of forestry and forest policy; silviculture; forest protection; utilization; mensuration; forest management; forest valuation and finance (Howe, 2004). Based on experiences, preparing a forester to manage situations involving landscape-scale, long-term, multiple resource use, common-property issues with multiple stakeholders is no easy task with current realities. Kanowski (2001) and Kleinschmit (2020) have re-emphasized the famous Jack Westoby's work of 1971 that forestry education should be designed in such a way that (1) it helps the student to discern what knowledge is relevant, where to find it, and how to use it; (2) brings the student to an understanding of the interrelatedness of phenomena, and the interpenetration of the various disciplines and (3) cultivate in the student a sense of responsibility for his own actions and for the welfare of others.

In line with the philosophy of the Department of Forestry and Wildlife Technology of the Federal University of Technology Owerri, Nigeria which lays emphasis on *do-it-yourself* backed with sufficient training, has broadened and consistently revised her curriculum (two times in seven years 2010-2017) to include courses and expand synopsis in Resource Inventory, Natural Ecosystem, Urban Forestry, Agroforestry Technology, Land Use Systems/Planning among others which courses have minimum of two (2) weekly contact/credit hours with stress on guided as well as independent practical components (Department of Forestry and Wildlife Technology, 2017). These aspects of forestry did in time influence idea-focus and experiences of tropical forestry in the trainees and students.

The above philosophy seems to be in no sharp disagreement with the proposition of Bourgeois (2001) who, representing corporate employers, proposed the provision of understanding of strategic planning for idealized objectives in students as well as ability to work as a team member capable of building relationships.

Nonetheless, our perceived failure in forestry education across continents might not be so much on our inability to conduct interdisciplinary research but the inability to integrate and synthesize the results of our researches (Temu and Kiyiapi, 2008; Koutsoukos *et al*, 2015). In other words, it is more of a thinking problem than a doing problem. The ability to pool and integrate the large volumes of information from forestry and corollary disciplines has not been adequately synthesized and honed in formal forestry education at any training category. Much energy and attention have been paid in the collection of data in forest science while too little effort has been invested in integrated teaching frameworks that are commonly applied to management of resources (crop, livestock, wildlife and other natural resources).

A challenge is to design opportunities and platforms for digging deep as well as breath-building into forestry students and upcoming forestry professionals (ICRAF, 2008). This would expectedly make them both generalists as well as specialists. Since the way a subject is taught has a significant impact on its effectiveness and realization of its defined objectives, contemporary approaches must focus on the use of experiential and learner-centered teaching techniques (Wurdinger and Carlson, 2010). Experience from community schools in Karachi Pakistan as contained in Qutoshi and Poudel (2014) also shows that learner-centered techniques such as discussion, work groups, brain-storming, case study, role play and demonstration supported by outdoor education outside the narrow limits of the conventional classroom, such as field trips and fieldwork increase participation in learning process and encourage the development of critical thinking and communication skills.

### **Research Style**

This study adopted review process and also tried a combination of some perceived teaching styles that seemingly reinforce trainee self-enquiry and aptitude in selected need-based issues in resource management. Reviews involved evaluations and assessment of cognate global trends topical to forestry education discourse. Trials of some teaching styles focused a small sample of 63 forestry trainees in Federal University of Technology Owerri Nigeria. This is not a statistical sample of all forestry trainees in the above university but undergraduate students in their terminal degree pursuit who enrolled into the course - Forestry Extension, Education and Development who are presumed to enlist among prospective practitioners in the near future. In line with conventional educational practice, predetermined learning outcomes were in terms of criteria reference and expanded opportunity to learn (Paper New Guinea Department of Education, 2008).

Following exposure to a combination of teaching styles and techniques (brainstorming, e-learning, case studies etc), kellen plan (an innovative personalized system of instruction specific developed by Fred Keller) of a maximum of two weeks for trainees progress evaluation focused on innovative and workable initiatives generated by each trainee and evaluated by three (3) independent assessors including professionals outside university environment. Similar creative approaches in teaching forestry have been tested and evaluated at University of Vermont (Vermont Forestry Action Plan, 2017). Analysis of results was descriptive and the presentations were in tabular forms with key measures of central tendency.

## Evaluation and Assessment of Findings

### *Cognate Paradigms in Higher Forestry Education and Sustainable Forest Management*

The review observed series of documented paradigms for forest management which revolved around the thrust of Rebugio's view. This will serve as guiding proposal and framework for redefining and redirecting forestry which can serve as a guide for 21<sup>st</sup> century forestry practitioners.

**Table 1:** Rebugio's proposal for new conceptualization of Forestry Profession and Practice

Conceptual Categories	Assumptions	
	Old Paradigm	New Paradigm
Forests	Specialized shops producing one (timber) or few products	Emporium of multiple products and diverse services
Foresters	The technical experts and forestry authority who manage forests themselves	Technical experts and competent social practitioners as well as leaders in forest resources management who manage forests in partnership with others
Forestry Discipline	A biological and physical science	Bio-physical and social science

*Adapted from (Rebugio, 1998, 2000; Rebugio and Camacho, 2003)*

By this foundational thesis, forestry education if well adopted and implemented should be able to incite and prowl the needed change(s) in terms of knowledge, attitudes, values and skills both in foresters and non-foresters who are not mutually exclusive in the utility of the products and services from such a nature resource as forest. Through formal education, under which pedestal defined anticipated professional goals can be driven, forests, foresters and forestry discipline will in this Rebugio's new paradigm chart, promote and stimulate advocacy, information/knowledge generation and human capacity building which are needed for 21<sup>st</sup> century forest management if locally and trans-continentially adopted and domesticated.

## Models for Forestry Education in Africa

Two key models have been applied in forestry education. One model regards forestry as a professional discipline similar to law and medicine; the other model regards forestry as an undergraduate pursuit similar to many other courses of study as those in agriculture and other disciplines. Both models accept a utilitarian view that forests are significant to human life and sustenance. However, obvious differences between these two models arising from the dichotomy of professional thrust will of necessity determine the future of forestry education regionally, continentally and globally. In Africa, for instance, as well as in other developing societies, the undergraduate model (requiring 4-5 years of training) is blended with components of basic liberal arts and meeting university core education requirements (emphasizing breadth). The *sub-professional model* offers relatively less scientific depth but more of liberal breadth unlike the professional model which offers more scientific depth with less liberal breadth.

Again, it can be seen that forestry education at the professional level being closely knitted to the trends and needs that brew around the undergraduate forestry curriculum

model. Many of the students who enter forestry professional programmes are forestry undergraduate students. Thus, undergraduate education of necessity ought to be as deep as possible to provide some sufficient insights into contemporary forestry needs and challenges.

The inception of forestry education in Africa was largely patterned and shaped following majorly professional models that were already in place in America and Europe around the 1930s (Nwoboshi, 1988). The framework was very vibrant and promising and thus copied/adopted by Africa although the objective was selective and underemphasized economic, socio-cultural and ecological/environmental issues (Wyatt-Smith, 1970). From the 1970s-1990s, many African countries and their universities de-emphasized the above stated forestry objective (copied from America and Europe) and adopted their own teaching style(s) to realize their own defined continental/respective national forestry mandates.

**Table 2:** Some Higher Institutions in Africa offering Forestry Courses and their Key Teaching Styles

Country	Institution	Style of Teaching
Algeria	Abou Bark Belkaid University	Lecture method
Burkina Faso	University of Quagadougou	Seminar
Cameroon	The National Forestry University of Cameroon	Lecture method
Egypt	Forestry University Alexandria	Workshop method
Ghana	University of Renewable Natural Resources	Lecture method
Kenya	University of Eldoret	Outreach
Nigeria	University of Ibadan	Lecture method
Senegal	Cheikh Anta Diop University of Forestry	Seminar
Uganda	Makerere University of Forestry and Nature Conservation	Lecture method

*Adapted from FAO (2008)*

The traditional lecture method which characterizes teaching in forestry discipline across Africa seems to have predominated over the years with apparently no wide variations and concrete synergies amongst the forestry milieu especially across geographically and culturally uniform sub-regional groupings. The proposition of the Advisory Committee on Education as earlier reposed in FAO (1994) for competency-based and culturally oriented harmony among forestry education stakeholders seems to have yielded no good results. Needed thrust should be revived in educational cooperation and this can only be engineered not by government (African governments), her agencies or politicians but organized national forestry groups especially forestry educators.

### Description of Trial Teaching Styles

Results generated on the above included key details of the sample trainees as well as learning outcomes from the teaching styles tried out.

Table 3: Some background Information of forestry trainees during the study (N=63)

Variables	Categories	Freq.	%
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Gender	Male	15	23.8
	Female	48	76.2
Age (years)	18 - <20	20	31.7
	20 – 24	43	68.3
Previous teaching styles trainees have been exposed to	Conventional lecture method	58	92.1
	E-learning	-	-
	Blended learning	12	19.0
	Kellen plan	-	-
	Z – A method	16	25.4
	Case method	-	-
	Brainstorming	-	-
	Project management	29	46.0
Average cumulative on trainees past performance assessment	High (70% and above)	14	22.2
	Medium (40% - <70%)	45	71.4
	Low (<40%)	4	6.3
	Mean Score = 51.3% Standard Deviation = 23.64		
Career specification	In-forestry course of study	58	92.1
	In forestry-related course of study	5	7.9
Proposed area of career interest	Tree taxonomy	21	33.3
	Forest genetics	10	15.9
	Environmental forestry	12	19.0
	Wood science	10	15.9
	Forest management	6	9.5
	Wildlife/Animal Management	Science 4	6.3

The correspondingly high enrollment of females into forestry discipline (76%) than males appears to be spectacular as against what obtained some decades past when males dominated forestry learning and profession. More so, the dominance of the age-group (20 years +) who belong to the Z-generation (internet age) could be reflective and showing even greater prospects for innovative and computer-based learning, enquiries, cooperation and partnerships.

With exposure to varying teaching styles in the past, results of previous cumulative assessment score showed 22% of trainees scoring over 70% in the overall forestry courses taken. The majority of the trainees (71%) fell within mid-scores ranges of 40% - <70%. Importantly, the reposed interest in varied areas of forestry with the above small sample of trainees again signals some good trend and optimism that given needed professional and mentoring assistance, the envisioned new paradigm in forestry profession and practice could be taken to the next level at least within short and mid-term range.

**Table 4:** Evaluation of Performance of Trainees following exposure of New Teaching styles

Variables	Categories	Freq.	%
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Average performance by Assessor I (Evaluation of learning outcomes after periodic fortnight: 2 credit hours/week)	High (70% and above)	38	61
	Medium (40% - <70%)		
	Low (<40%)		
Average performance by Assessor II (Evaluation of learning outcomes after periodic fortnight: 2 credit hours/week)	High	59	59
	Medium		
	Low		
Average performance by Assessor III (Evaluation of learning outcomes after periodic fortnight: 2 credit hours/week)	High (70% and above)	74	74
	Medium (40% - <70%)		
	Low (<40%)		
	Mean Score = 64.7%		
	Standard Deviation = 16.38		

In Table 3, young forestry trainees had in the past been exposed majorly to lecture method (92.1%) which further justifies earlier documented dominant teaching style across African educational institutions. Previous cumulative evaluation of the trainees (average performance of 51.3%) as contained in Table 3 showing trainees' performances as taught using specified teaching styles. Case method/case studies (consisting in presenting trainees with a case and putting them in the role of a decision maker facing a defined problem; kellen plan (a personalized training method in which every student makes progress at his/her own pace in which case one should fully understand earlier units before proceeding to later units) and e-learning (or online learning through the internet or institutional intranet) were distant from previous teaching experiences and exposures of the trainees in this study. Hence, they could have been very absent from inclusion in forestry teaching module. However, they form integral part of modern-day teaching methods although reflective of the level of economic and technological advancement. Past generations of African forestry professional could have been similarly trained using same prevalent teaching/learning styles.

In Table 4, an integrated teaching mode which consisted in blended learning - hybrid learning combining online (e-learning) and face-to-face instruction (conventional lecture method); brainstorming (in which trainees bring to their mind preexisting notions freely and spontaneously by expressing key words/terms related to a given forestry concept), creation of periodic interactive platform accompanied with trainee evaluation and key case studies among others could have necessitated improvements in learning outcomes. There was a comparatively lower deviation of 16.38 (Table 4) from 23.64 (Table 3) in trainee assessment report with corresponding average assessment of 64.7% from 51.3%. Importantly, trainees in this trial study could with such needful stimulation and prop make systematic and informed evaluations of a given problem issue of forestry importance with even minimal guidance and supervision from trainers. This trial could be replicated with larger sample of trainees to verify and/or justify or otherwise the veracity and efficacy of these propositions as applicable in tropical forestry education.

These practices and teaching styles which tend to activate the cognitive senses stimulated learning and apprehension among trainees, thus a sharp departure from writing-to-pass to learning-to-know and practice syndrome among African students and learners. The psychological foundations of learning emphasize much on variations in teaching and learning methodologies which consist in and not limited to group work and interactions, outdoor field engagements, self discoveries, periodic interactive with needful backstopping platforms and the likes.

### **Key Observations**

Students entering higher institutions from post-primary school (equivalent of high school) generally belong to Z- generation. These are those born between 1996 and the present (<25 years). They have a conscious and almost immediate access to the internet which has the benefit of increasing their knowledge (Mohr, 2017). Many of these traits result in students that learn best with hands-on activities. This trend can give some rays of hope on readiness of future generations to confront even the direst forestry challenges with whatever tool(s) available within their disposal. However, the sting of plagiarism and seemingly the possible bold dints on originality cannot be over-emphasized thus necessitating an integrated and holistic teaching and learning method.

We need to consider developing curricula that include more mix of trainees from various disciplines through the use of multidisciplinary teams in teaching. In the future, teams of scientists from multiple disciplines will carry out much or even more of forest researches, and this requires collaboration, team building and renewed disciplinary commitment and neutrality. This mix will help facilitate forestry trainees and build inter-personal communication skills which is expected to help them explain, in a reduced-jargon environment, what they are doing and why they are doing it. This is healthy disciplinary partnership that builds both scholarship and mutuality.

This envisioned new direction for forestry education should develop joint training to ensure a dose of university as well as out-of-university mentoring expertise in fields where expertise might be dispersed. Regional cooperation is here viewed as a way to strengthen and expand capacity and step up specialization by pooling resources in important areas of need (McDonough and Wheeler, 1998). This will include and not restricted to universities, governments, industries and private groups.

The spate of current North-South collaboration does not call for celebration. The lopsided nature in forestry education between the North (developed world) and the South (developing and under-developed world) should be a source of worry to forestry educators especially Africans. Governments across the respective continents have not shown significant interests to bridge this divide. To save the profession and to better secure the future of our planet earth (which in the event of any catastrophic scenario has trans-boundary effects), much more collaboration is highly recommended.

### **Recommendations**

Our undergraduates are not averse to innovations in learning. Peer group educational learning and other guided socialization platforms should be considered as veritable agencies for off-school learning. Again, given the fact that forestry undergraduates are drawn from secondary schools (basic high schools), as a step towards a successful trial of the envisioned scenario, there is need for review of the in-school training methodologies practiced in

primary and post-primary institutions. This is expected to be gradually introduced in our Colleges of Education (where school teachers are trained) as part of College proposed curriculum review. Thirdly, the study observed almost parallel conventional teaching methods as well as deficits in modern infrastructural built in tertiary education. Against this backdrop, forestry educators especially at higher education level ought to have minimum education certification and provision of and support for novel learning infrastructure by government, university administrators (including forestry professional bodies) for teaching and learning.

More so, it is imperative that a robust national/continental forestry roundtable ought to be urgently convened with key stakeholders at the fore. There is need for urgent deliberation and proactive actions by the academia (educators) towards highlighting the scenario as a national forestry sub-sectoral dilemma and emergency.

At the moment, no long-term forestry education plan is in place in Nigeria and across Africa. This can only be fostered by forestry organizations and professionals (e.g. Forestry Association of Nigeria, International Society of Tropical Foresters etc) in collaboration with tertiary education managers (e.g. National Board for Technical Education NBTE, National Universities Commission NUC).

## Conclusion

Newer or more student centered techniques here includes group activities, active learning or cooperative learning, problem based learning, discovery based learning, experiential learning or nontraditional forms of assessment. Whatever the innovative teaching methodologies and styles are, they should reach the expectations of forestry trainees after completing their training in forestry. This is not at the expense of the expectations of the industries and external world which must also be kept in mind also by forestry education administrators and planners. There has to be a stronger and more concrete agreement in the strategies and implementation modules of the demands in sustainable development on the one hand and among trainers and trainees, and on the other hand among students and other prospective entrants into the profession who are likely to be the ambassadors and hope of forestry in the future.

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