Designing a curriculum for a modular PG Diploma in University Teaching for Malawi using DACUM approach.

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Received: January 16, 2019 Accepted: March 04, 2019

ABSTRACT: *The purpose of this study was to identify the competencies required out of an entry level Teacher in University Teaching at Malawi and to design a modular PG programme suiting to the job role because effective teacher learning and professional development is important for student achievement. In this paper the authors present a scientific and systematic Job analysis, thus ranking the roles of an entry level Teacher using Analytical Hierarchy Process (AHP). The study also reveals that DACUM approach is used in the curriculum design for PG Diploma in University Teaching meant for the Teachers so as to avoid the mismatch between the graduate skills and Industry requirements.*

Key Words: : *Analytical Hierarchy Process (AHP); DACUM; Job analysis; Curriculum Development.*

1. Introduction

1.0 Country Profile

Malawi is a landlocked country in southeast Africa that was formerly known as Nyasaland. It is bordered by Zambia to the northwest, Tanzania to the northeast, and Mozambique on the east, south and west.
Lake Malawitakes up about a third of Malawi's area.Malawi coversan areaof over 118,000 km^2 with an estimated population of 18,091,575 as at July 2016. Its capital is Lilongwe, which is also Malawi's largest city; the second largest is Blantyre, the third is Mzuzu and the fourth largest is its old capital Zomba.

1.1 Education system in Malawi

The Malawi education system consists of primary, secondary and Tertiary education. The Primary school education is made up of eight years, and has Standard 1 to Standard 8. The primary is largely dominated by children of ages 6 -14. Students must gain a Primary School Leaving Certificate based on their Standard 8 final exam results in order to progress to secondary school.Secondary schools in Malawi are run in four years with Form 1 to Form 4 and dominated by students of ages 14-17. Students graduate with Malawi Secondary Certificate of Education (MSCE) from secondaryAccess to higher education is based on passing of MSCE and almost all Universities require six credits including for admission. University education is made up of 4 to 5 years depending on the degree and 5 years is for engineering and medicine. According to UNESCO report of 2016, 57% of the pupil fails to complete primary school and 19% of those that attend primary school proceed to secondary school. Only 7% of total number of those are enrolled in primary completes secondary education secondary. On tertiary education, only 1% of totalnumber of those enrolled in primary studied beyond secondary level. Currently Malawi has 4public universities, 21 private universities and 30 colleges. Universities offer undergraduate and post graduate degrees whereas colleges largely offers diplomas and certificates.

1.2 Need for pedagogical skills training for lecturers in Malawi

According to Mambo, M. e tal 2016, universities have made some effort to improvelecturers teaching methodology. For Example University of Malawi (UNIMA) each college has established Committee on University Teaching and Learning (CUTL). The study conducted by to Mambo, M. e tal 2016 indicated that there is a poor attendance to workshops organized by CUTL on teaching and learning in all the UNIMA colleges.College of Medicine (CoM) a constituent college of University of Malawi has introduced Basic Certificate in Medical and Health Science Education (BCMHSE) for all it lecturers. BCMHSE is a university teaching certificate with twelve modules on different pedagogical skills ranging lesson planning module to assessment modules, currently more than half of the lecturers have so far enrolledfor the course. MzuzuUniversity (MZUNI)also has a UniversityCertificate of Education (UCE), but the programme is not customized to the different needs of the faculty and few faculty members have studied UCE at Mzuni this far. MZUNI UCE is largely patronized by secondary school teachers how have non education degrees and are

teaching in secondary school. The study also found out that Catholic University of Malawi (CUNIMA)and Malawi Adventist University (MAU)conduct pedagogical workshops for their lecturers but challenge is also attendances. University of Livingstonia (UNILIA) has developed manuals for lecturer use but has no formal programme in this regard. The information provided by universities regarding the effort to promote pedagogical and andragogical skills training show wiliness by the Universities to improve the pedagogical skill for their lecturers. It is for this reason that this research is carried to develop a curriculum model using DACUM and HAP that will guide the development of aunified and appropriate post graduate Diploma in University Teaching for lecturers in Malawi. This Diploma will be for all serving lecturers in Malawi and will have major core modules for all lecturers and separate modules for Science lecturers, Social Science lecturers, Language lecturers and Health Science Lecturers.

1.3Curriculum development process in Malawi

On 25th and 26th June 2018 National Council for Higher Education organized a workshop on development of a uniform curriculum template for universities in Malawi. The workshop drew participants from all almost the universities both public and private in Malawi. For the discussion it was clear that in Malawi the commonly used model for curriculum development is Tyler model. Tyler is probably the most used model in curriculum development since it was published by Ralph Tyler in 1949. Figure 1 outlines Tyler model.

Figure1: Tyler's Model

Figure 2 outlines Tyler's conceptual framework. According to Tyler educational objectives originate from three sources: studies of society, studies of learners, and subject-matter specialists. These data systematically collected and analyzed form the basis of initial objectives to be tested for their attainability and their efforts in real curriculum situations (Lunenburg, 2011). The tentative objectives from the three sources are filtered through two screens: the school's educational philosophy and knowledge of the psychology of learning, which results in a final set of educational objectives as show in Figure 2.

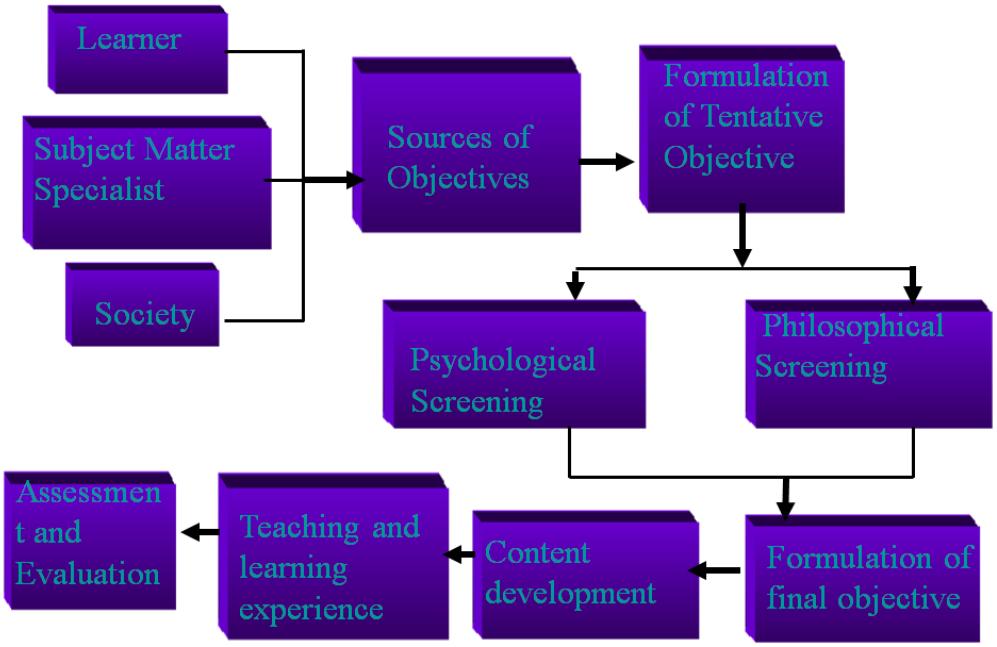


Figure 2: Tyler's Conceptional Framework

1.4 Need for DACUM in developing PGD in University Teaching curriculum.

DACUM is an acronym for Developing a Curriculum. DACUM is a process that incorporates the use of a focus group in a facilitated storyboarding process to capture the major duties and related tasks included in an occupation, as well as, the necessary knowledge, skills, and traits (Norton & Moser 2008). DACUM is a cost-

effective method that's provides a quick and thorough analysis of any job (Norton, 2009). Those that are involved in analysis of the job roles and tasks are those that do the job and not those that know the job. It is for this reason that DACUM is proposed to be used in development Post Graduate (PD) Diploma in University Teaching for academic staff in Malawi. The proposed process will begin with analysing roles of the lecturer by academics themselves. The analyzed roles will form a basis for formulation of intended learning outcome. In addition, the use DACUM in development of this curriculum has been motivated by findingsof World Bank study on the quality and relevance of graduates in Malawi. In a report titled Improving Higher Education in Malawi for Competitiveness in the Global Economy, the World Bank says the supply of qualified graduates in Malawi is low both in terms of quality and relevance (Mambo e tal, 2016). In terms of the quality and relevance of the programmes offered by the higher education sector, it is reported that the quality is low and not relevant to the needs of the industry. According to the report, this is as a result of universities having weak linkages with the industries or potential employers with regard to programme development and curriculum review. In addition, the increase in enrolment is also not aligned with the needs of the labour market. In summary the report says that there is a mismatch between the graduate skill and skills required by the industry. It is therefore argued that, there was not job role analysis during the curriculum development for such programme, because if there were any these mismatches could be avoided. To avoid this mismatch between the lecturer's roles and training to be provided, the roles will be analyzed.

1.4.1 Advantages of DACUM approach to curriculum

The following are the advantages of DACUM

- The expert committee procedure results in a relatively low development cost.
- The time frame for conducting the DACUM activity is relatively short.
- DACUM allows curriculum content to be derived without the aid oremployment of professional curriculum writers.

DACUM's advantage over the traditional introspection process is certainly clear (Schnellert, 1993). The process allows more up-to-date and relevant content to be identified and incorporated into a curriculum. At first glance, the DACUM method appears no different from the traditional trade and job analysis process. A closer observation would show that traditional approaches rely on the instructor to determine what the content should be with little direct consideration given to input from persons employed in the actual occupational setting (Schnellert, 1993).

1.5 How DACUM has overcome gaps in Tyler curriculum model

Tyler curriculum model draw the objectives of the curriculum form the studies of society, studies of learners, and subject-matter specialists.This does not consider the roles and tasks of the job the curriculum is designed for. Whereas DACUM begins with DACUM session, where high-performers are convened in a focus group panel that is led by an experienced DACUM facilitator to analyses the job.The DACUM philosophy states that high-performers are the best source for information concerning their roles or positions (Norton and Moser, 2008). This therefore results in identifying skill gaps and prioritizing education and training needs, thus ensuring that education and training resources are targeted at desired performance.

1.6 Objective of the research

The research aims to:

i. Develop a model for designing a curriculum for a modular PG Diploma in UniversityTeaching for Malawi using DACUM approach.
ii. Prioritize module selection for PG Diploma in University Teaching for Malawi

2. Overview of DACUMand AHP process

2.1 DACUM process

Figure 3 summarizes the DACUM process of curriculum development

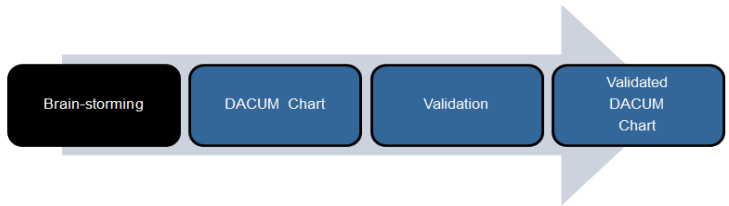


Figure 3: DACUM process

Step One: Initial Occupational Profile

In the DACUM process, high-performing incumbent workers analyze their own job. DACUM utilizes a panel of six to eight high-performing incumbent workers. Over a two-day period, these skilled workers identify the duties and tasks that make up their job (Norton & Moser 2008). Under the direction of a neutral facilitator, the panel analyzes their job-related tasks while using a modified brainstorming process that encompasses a storyboarding technique. The final result is an occupational profile presented in a chart format, which describes a job in terms of specific duties and tasks that competent workers must perform. During the process, tasks are also ranked.

Steps Two & Three: Validation Process

The occupational profile is validated and vetted through various methods. A peer-review process is utilized in a validation workshop to review the initial profile. Once peer reviewed, the profile can then be analyzed through a management review, allowing the management team to synthesize what the workers said, with what they expect and believe the job should encompass.

Steps Four & Five: Curriculum Development

Once the profile has been validated, a task analysis can be conducted to further define the job. The validated profile and the task analysis can then be used to develop a curriculum as show in figure 4.

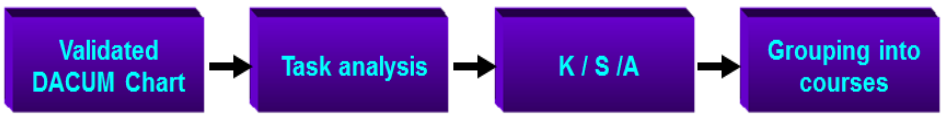


Figure 4: Task Analysis

2.2 The Analytic Hierarchy Process

The Analytic Hierarchy Process (AHP), introduced by Thomas Saaty (1980), is an effective tool for dealing with complex decision making, and may aid the decision maker to set priorities and make the best decision(Raharjo et al., 2009).

2.2.1 How the AHP works

The AHP considers a set of evaluation criteria, and a set of alternative options among which the best decision is to be made. It is important to note that, since some of the criteria could be contrasting, it is not true in general that the best option is the one which optimizes each single criterion, rather the one which achieves the most suitable trade-off among the different criteria (Saaty, 1980). The AHP generates a weight for each evaluation criterion according to the decision maker's pairwise comparisons of the criteria. The higher the weight, the more important the corresponding criterion. Next, for a fixed criterion, the AHP assigns a score to each option according to the decision maker's pairwise comparisons of the options based on that criterion. The higher the score, the better the performance of the option with respect to the considered criterion (Saaty, 2008). Finally, the AHP combines the criteria weights and the options scores, thus determining a global score for each option, and a consequent ranking. The global score for a given option is a weighted sum of the scores it obtained with respect to all the criteria Table 1 shows the weighting factors based on priority for AHP.

Table 1: The fundamental scale of absolute numbers

Intensity ofimportance	Definition	Explanation
1	Equal importance	Equal importance Two factors contribute equally to the objective
3	Somewhat more important	Experience and judgment slightly favor one over another.
5	Much more important	Experience and judgment strongly favor one over another
7	Very much more important	Experience and judgment very strongly favor one over another. Its importance is demonstrated in practice
9	Absolutely more important	The evidence favoring one over the other is of the highest possible validity.
2, 4, 6, 8	Intermediate values	Compromise is needed

Reciprocals of the above	If activity i has one of the above non-zero numbers assigned to it when compared to activity j, then j has the reciprocal value when compared to i	

The matrix of pairwise comparisons A = (a_{ij}) represents the intensities of the expert's preference between individual pairs of criteria (alternatives) ($B_i$versus B_j, for all i, j = 1, 2, …,n). They are usually chosen according to a given scale (1/9, 1/8, …, 8, 9). Given n criteria (alternatves) {B1,B2,…, Bn}, a decision-maker compares pairs of criteria (alternatives) for all the possible pairs, and a comparison matrix A is thus obtained, where the element a_{ij} shows the preference weight of Bi obtained by comparison with B_j (Hans, 2005).

3. How DACUM and AHP process is useful for to designing curriculum for Post Graduate Diploma in University Teaching for university

3.1 DACUM and curriculum development

Traditionally, the curriculum development process begins with a Needs Analysis, also called a needs assessment, which can be conducted in different ways. In a case, the goal of needs analysis will to identify the gap in the skills and abilities need for a lecturer in order to perform his/her duties effectively. The need analysis will be followed by Job Analysis that will be done at DACUM workshop. To begin with, Hamrick 2008 state that thee lecturer has three major roles; teaching role, research role and service role

a) Activities under teaching role include :
   i. Preparing and delivering regular lectures for students
   ii. Preparing and marking student assignments, essays, exams and providing one-on-onefeedback on academic performance where necessary
   iii. Participating in curriculum development/revision and academic planning
   iv. Invigilating examinations
   v. Conducting tutorial sessions, seminars and laboratory classes (where relevant)

b) Activities under research role
   i. Supervising the research and project work of Postgraduate and undergraduate students.
   ii. Preparing bids for funding for departmental research projects and Managing research budgets
   iii. Conducting further research into their specific field of knowledge/interest
   iv. Writing research proposals, papers and other publications
   v. Attend workshops / Conferences within an outside the university

c) Activities under service role
   i. Activities Institutional service
      - Serving on internal committees and advisory board
      - mentoring and advising students,
      - Assuming part-time administrative appointments as program or unit leaders.
      - Assume term appointments in fulltime roles as mid-level or senior level institutional administrators.
   ii. Activities under Community outreach
      - Advising the community on various issues
      - Facilitating training for members of the community
      - Offering service to the community like clinical services, outreach to a farmer or small business owner, etcetera

In order to justify how DACUM will be useful, we identified the roles and tasks of the university lecture and we will prioritize them using AHP.

3.1.1 Participants of DACUM workshop for the PD Diploma in University Teaching

It may be argued that the roles and tasks of a lecturer are clear and there is no need to waste time to analyse them. However, to produce a curriculum that will be fit for purpose the tasks need to be analyzed and prioritized. The participant in to the DACUM workshop will include a group of 8 to 12 senior academic staff. The outcome of the DACUM expert workshop will be a DACUM chart. The experts should be a representative of all the three main roles of a lecturer; therefore it should include expert in teaching and learning, research and education administration. Teaching and learning expert should be senior academic

staff with good teaching skills and in depth knowledge of pedagogy and andragogy. Research experts should be a senior academic staff with vast experience in research and have publications in high impact journals preferably a professor. Finally, administration experts should be senior academic staffs that have served in positions like Head of Department, Deans and any other administrative position in an academic institution. Table 3 give the summary of the experts' roles at the workshop and the required attributes.

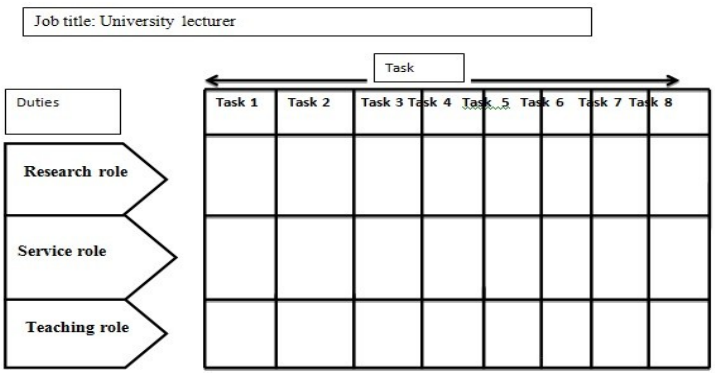
Table 3: Roles of participants at DACUM workshop

Participants	Qualities	Role at the workshop
Teaching and learning experts	• In depth Knowledge in pedagogy and andragogy • Experienced and well known history as an effective teacher • A formal qualification in education	Analyse tasks and rank tasks related to the teaching role
Research experts	• Vast experience in research • A considerable number of publication • Experience in managing research projects • Experience in guiding scholar	Analyse tasks and rank tasks related to the research role and community utreach role
Education administration expert	• Vast experience in education administration • Served as HOD or Dean for not less than five years • Experienced in providing deferent service to the community as academicians	Analyse tasks and rank tasks related to the administrative role and community outreach roles
Facilitator	• Knowledge in DACUM • Ability to establish and maintain Enthusiasm and rapport with the participants • Sense of humor and patience • Ability to motivate and encourage participants • Sensitivity to verbal and non-verbal communications	Guide the experts on the DACUM process

3.1.2 Why perform Task analysis for the lecturer's roles

Task analysis is very important to performed, this will help to identify the most important tasksand weight the tasks using AHP. It will be naïve to believe that the proposed PD diploma can contain content that will provide knowledge and skills to lectures in all tasks they perform on day to day. Therefore, the results of the analysis and ranking will help in making a decision on what content or subject matter should be taught in the programme in order to equip lecturers with required skills, knowledge and attitude for them to perform the task with optimum productivity. In addition, the analysis will avoid bias of the expert on content selection. Furthermore, analysis will help to decide the standards that will be used to evaluate the learner's performance. If task analysis is done properly it will avoid teaching unnecessary content.Table 4 is a DACUM chart that will be produced at the end of the two day DACUM workshop.

Table 4: DACUM chart



3.1.3 Tasks verification

After the DACUM Chart is developed by a group ofexperts it will further bevalidated by larger group of expert s. The larger groupwill identify duties and tasks that are relevant or important to the lecturer. The following criteria will be used to select the relevant task.

- Is the task actually performed by the lecturer?
- How important is the task?
- How difficult is it to learn to perform the task?
- How frequently is the task performed?
- Can it be improved to perfection with works experience without any form of training?

3.1.4 Instruction selection

Data collected from task verification exercise by the larger experts meeting will be statistically analyzed, then the data will be used AHP to rank the tasks. The result from AHP will become a basis for decisions about which tasks should be taught and which should not. Instruction would typically not be provided for a task that is of low importance or of low difficulty or that is performed rarely by the lecturer. Instruction would be provided for the task(s) which is/are new to the lecturers and they have not yet been formally trained to perform the task. This data is also valuable for creating intended learning outcomes and eventually test blueprints for the programme.

3.1.5 Instructional Competency Profile

Often, there are multiple tasks in the role that require basically the same knowledge, although the knowledge may be applied differently. For instruction, it often makes a lot of sense to cluster such tasks together and write a new competency statement that encompasses all the similar tasks.

3.2 AHP and prioritization of roles, tasks and module section

The PG diploma will be delivered using a modular structure. A module is a component of a course or degree subject with its own approved aims and outcomes and assessment methods (Adam, 2008). The modules will be developed based on the task. After the tasks have been identified and prioritized, modules will be developed on each task. For the modulesto proportionally represent in the curriculum, the weight for each task will be calculated using AHP and tasks weight will be translatedinto module weigh in the curriculum. These weights will be used to decide the credits for each course, section 3.2.1 demonstrate how this will be done. AHP will be used to easy the process of deciding the content that will finally be included in the programme out of the pool of the proposed content for each module. AHP will be used because the group of experts will compromise of decision makers with dissimilar contradictory intentions who will need to attain at a consensus decision.Mirzaei, (2013) stated that groups that are involved in curriculum planning include interested group, competent group, and the influential group. The cooperation of these three groups improves the quality of programs and the carelessness of their ideas would reduce the efficiency and effectiveness of the programs. He further urged that AHP is the suitable method that can help to select the right decisions in all phases and procedures of curriculum planning process. In addition, according to Tam and Tummala, 2001, AHP can be beneficial in connecting many decision makers with contradictory objectives to attain at an agreement or a common decision''. In their study, an AHP-based model is devised and applied to a real case study to scrutinize its possibility in selecting a retailer for a telecommunications system. Schniederjans and Garvi,(1997) also found AHP to be useful in selecting multiple cost drivers for activity-based costing through multi objective programming methodology. Fundamentally, AHP focuses on quantifying relative priorities for a set of alternatives on a ratio scale based on decision makers' judgments and stresses the significance of intuitive judgments of both a decision maker and the consistency of comparison of alternatives in decision-making process (Harbi, 2001).

3.2.1 Role and Task prioritization using AHP

Hamrick, (2008) outlined three major roles of a university lecturer, these include; teaching role, research role and service role. The proposed PG diploma should contain modules or subject matter on at least each of these roles. However, the question is what portion should each take. His therefore calls for AHP to provide the weighting to each role. This will also help to avoid favoring one role other the others roles. Usually the teaching role is favored in such training forgetting that research, community service and administration roles are equally needed in the continuous professional development of the lecturerin order for him/her to become a complete whole. Each of the three roles has tasks and these tasks will assist to identify the modules to include in the curriculum. Based on the role of lecturer and, taking into account the views of Hamrick, (2008) the roles of the lecture can be summarized into three major roles and consistingof 14 major tasks, the hierarchical structure of which is summarized in Table 5. As part of demonstrating how

calculation on AHP roles and tasks periodization, we have used our judgment based on our experience to come up with a pair wise comparison matrix for the roles and tasks. We do not claim that these tasks presented in Table 5are the only ones; the experts during the DACUM workshop may update thesetasks andthe ranking.

Table 5: The hierarchical structure of teacher's tasks

Goal (G)	***Criterion(C)***	***Alternative (T)***
Roles and tasks prioritization	Teaching role: C_1	**T_{11}:**Preparing and delivering regular lectures for students **T_{12} :**Participating in curriculum development/revision and academic planning **T_{13}:**Preparing and marking student assignments, essays, exams and providing one-on-onefeedback on academic performance where necessary **T_{14}**Conducting tutorial sessions, seminars and laboratory classes (where relevant) **T_{15}:** Invigilating examinations
	Research role: **C_2**	**T_{21}:** Supervising the research and project work of Doctorate, Postgraduate and undergraduate students. **T_{22}:**Preparing bids for funding for departmental research projects and Managing research budgets **T_{23}:**Conducting further research into their specific field of knowledge/interest **T_{24}:**Writing research proposals, papers and other publications **T_{25}:** Attend workshops / Conferences within an outside the university
	Service role: **C_3**	**T_{31}:**Advising the community on various issues **T_{32}:**Facilitating training for members of the community **T_{33}:**Offering service to the community like clinical services, outreach to a farmer or small business owner, etcetera T_{34} Administrative role in the institution

Procedure for calculation

1. First the pair wise comparison has been done, for the parameters and a reciprocal matrix has been developed.
2. Fractional values are converted into decimal form and each column is added to get the column sum.
3. For normalization of column, each column element is divided by column sum, and then average of each row is calculated. The resulted average of each row gives that gives the priority values. Higher the priority value more will be the importance of criteria in
4. λ_{max} is calculated by multiplying matric in step 2 the weights column and then divide the sum of the row by weight. The average of theλ_{max} of each row is the λ_{max} the criteria.
5. Consistency ratio is calculated by applying formula $CR = \frac{CI}{RI}$

Consistency index (CI) *is* caluslated as follows $CI = \frac{\lambda_{max} - n}{n-1}$and random consistency index RI is are specific values shown in Table 6 and n is the order of the matrix.

Table 6: Value of Random Index (Saaty, 2008).

N	2	3	4	5	6	7	8	9	10
RI	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.51

Comparison Matrices

Table 7: Criteria matrix G and weights

Criteria G	*Teaching role (C_1)*	*Research role (C_1)*	*Service role (C_1)*	**Weights**	**Ranks**
Teaching role (C_1)	***1***	***3***	***5***	0.633	***1***
Research role (C_1)	***1/3***	***1***	***3***	0.261	***2***
Service role (C_1)	***1/5***	***1/3***	***1***	0.106	***3***

As shown in Table 7 teaching role is given preferenceseconded by research roles. Using the data in Table & it means the proposed PG Diploma will contain:

- 63.3% courses on teaching role
- 26.1% courses on research
- 10.6 % courses on service role.

This means 63% of this course will be designed to help the teacher improve on pedagogical skills, 26.1% of the courses will designed to help the teacher improve is skill in service delivery to the community as well the institution.

Table 8: Criteria matrix Teaching role (C_1)and its weight

Criteria C_1	**T_{11}**	**T_{12}**	**T_{12}**	**T_{14}**	**T_{15}**	**Weights**	**Ranks**
T_{11}	1	3	5	7	9	0.498	**1**
T_{12}	1/5	1/3	1	3	5	0.131	**3**
T_{13}	1/3	1	3	5	9	0.271	**2**
T_{14}	1/9	1/9	1/5	1/3	1	0.033	**5**
T_{15}	1/7	1/5	1/3	1	3	0.066	**4**

As shown in Table 8 the following are the proportion of each task on teaching role

Criteria	**Weightage**
T_{11}: Preparing and delivering regular lectures for students	49.8%
T_{13}: Preparing and marking student assignments, essays, exams and providing one-on-one feedback on academic performance where necessary	27.1%
T_{12}: Participating in curriculum development/revision and academic planning	13.1%
T_{15}: Invigilating examinations	6.6%
T_{14}: Conducting tutorial sessions, seminars and laboratory classes (where relevant)	3.3%

Table 9: Criteria matrix C_2 and its weight

Criteria C_2	**T_{21}**	**T_{22}**	**T_{23}**	**T_{24}**	**T_{25}**	**Weights**	**Ranks**
T_{21}	1/3	1/5	1	3	3	0.134	**3**
T_{22}	1/5	1/5	1/3	1	3	0.078	**4**
T_{23}	1	3	3	5	7	0.449	**1**
T_{24}	1/3	1	5	5	5	0.298	**2**
T_{25}	1/7	1/5	1/3	1/3	1	0.041	**5**

As shown in Table 9 the proportion of each task on research role is as follows:

Criteria	**Weightage**
T_{23}: Conducting further research into their specific field of knowledge/interest	44.9%
T_{24}: Writing research proposals, papers and other publications	29.8%
T_{21}: Supervising the research and project work of Doctorate, Postgraduate and undergraduate students	13.4%
T_{22}: Preparing bids for funding for departmental research projects and managing research budgets	7.8%
T_{25}: Attend workshops / Conferences within an outside the university	4.1%

Table 10: Criteria matrix C_3 and its weight

Criteria C_3	T_{31}	T_{32}	T_{33}	T_{34}	Weights	Ranks
T_{31}	1/5	1/3	1	3	0.121878	3
T_{32}	1/7	1/5	1/3	1	0.056893	4
T_{33}	1/3	1	3	5	0.263358	2
T_{34}	1	3	5	7	0.557926	1

As shown in Table 10 the proportion of each task and their prioritized weightage are as follows:

Criteria	Weightage
T_{34} :Administrative role in the institution	55.8%
T_{33}: Offering service to the community like clinical services, outreach to a farmer or small business owner, etc.,	26.3%
T_{31}: Advising the community on various issues	12.2%
T_{32}: Facilitating training for members of the community	5.7%

3.2.2 Calculating the weighing of each tasks

Table 11 shows the weight of each task. Each task has a corresponding module that will contain subject matter to assist the lecturer in perforating the task. The weight of in Table 11 corresponds to the percentage contribution of each module. The calculation used the combinatorial weights calculation adopted from Han (2005). The priorities of each alternative for the goal are referred to as combinatorial weights, and the components ofthe combinatorial weight vector are calculated as described by Han 2005.

3.2.2.1 Combined weights and combined consistency Check

$\mathbf{W_i} = \sum_{j=1}^{3} \mathbf{b_i c_{ij}}$(i=1,... ,14) , where each value of $b_j$and c_{ij} calculated using this formula is listed in Table 9 and combined consistency check is calculated using $\boldsymbol{CR} = \boldsymbol{CR_G} = \frac{\sum_{j=1}^{3} b_j CI_j}{\sum_{j=1}^{3} b_j RI_j}$

$$\boldsymbol{CR} = 0.02 + \frac{(\mathbf{0.633} \times 0.058) + (\mathbf{0.261} \times \mathbf{0}.0.00325) + (\mathbf{0.106} \times \mathbf{0.014})}{(\mathbf{0.633} \times \mathbf{1.12}) + (\mathbf{0.261} \times \mathbf{1.12}) + (\mathbf{0.106} \times \mathbf{0.9})} = \mathbf{0.001028}$$

$$\boldsymbol{CR} \approx \mathbf{0.001} < 0.1$$

The combinatorial consistency is acceptable, and the results of the global ranking are acceptable.

Table11: Weight of the Tasks

Alternative	*Criterion C*			*Combinatorial weights* w_i	*Module corresponding to the Task*
	C_1	*C_2*			
	c_1 =0.633	*c_2=0.261*	*c_3=0.106*		
T_{11}	T_{11} = 0.498	*T_{12} =0*	*T_{12}=0*	*W_1 = 0.315*	*M_1=31.5%*
T_{12}	0.131	0	0	*W_2=0.083*	*M_2=8.2%*
T_{13}	0.271	0	0	*W_3=0.172*	*M_3=17.2%*
T_{14}	0.033	0	0	*W_4=0.021*	*M_4=2.1%*
T_{15}	0.066	0	0	*W_5=0.042*	*M_5=4.2%*
T_{21}	0	0.134	0	*W_6=0.035*	*M_6=3.5%*
T_{22}	0	0.078	0	*W_7=0.020*	*M_7=2.0%*
T_{23}	0	0.449	0	*W_8=0.117*	*M_8=11.7%*
T_{24}	0	0.298	0	*W_9=0.078*	*M_9=7.8%*
T_{25}	0	0.041	0	*W_{10}=0.011*	*M_{10}=1.1%*
T_{31}	0	0	0.121878	*W_{11}=0.013*	*M_{11}=1.3%*
T_{32}	0	0	0.056893	*W_{12}=0.006*	*M_{12}=0.6%*
T_{33}	0	0	0.263358	*W_{13}=0.028*	*M_{13}=2.8%*
T_{34}	0	0	0.557926	*W_{14}=0.059*	*M_{14}=5.9%*

As shown in Table 11, each task is assigned a module(s) that will have content perterning to the task. The analysis shown that Module (M_1)under tasks T_{11}: Preparing and delivering regular lectures for students will contain the highest portion. It will take 31.5% of the total credit hours seconded by module (M_3)with 17.2% under task **T_{12}**:Preparing and marking student assignments, essays, exams and providing one-on-one feedback on academic performance where necessary.

3.3 Decision making for modules to be included the curriculum for PG Diploma

Based on the analyzed and prioritizedtasks of the lecturer the PG Diploma will have 14 modules from the 14 tasks and each task will have a module translating into 14 modules (M_1,M_2, and M_{14}) as shown in Table 11. Consideration that this will be a terra made programme for university lecturers that will aim at improving the performance of lecturers not all tasks will need prior formal learning before there are performed. Some

task will need the lecturers tojust practice and gain the skills. This therefore requires that a decision has to be made on what task will require just practice without taught knowledge or prior formal learning and which one will require taught knowledge before practiced and attain perfection.

3.3.1. Teaching role

The teaching roles has five tasks Table 12 give a description on the task regarding which task require taught knowledge and which one require to practice without taught knowledge. The five tasks have resulted into 5 modules M1, M_2, M_3, M_4 and M_5.

Table 12: Module section for the teaching role

Tasks	Module	Subtask	Knowledge required	Skills required after acquiring the taught knowledge	Require Practice without formal taught knowledge
T_{11}:Preparing and delivering regular lectures for students r	M_1	Preparing lessons	M_{1a}: Preparing lessons	Practice how to prepare a lesson under supervision of superiors until attains perfection.	-
		Delivering the lessons	M_{1a}: Learning theories M_{1b} :Use of ICT in teaching(Technology Enhanced Learning M_{1c} :Education Philosophies M_{1d} : Classroom Management M_{1e} : Instruction methods	Practice delivering ICT aided lesson using different methodologies under supervision of superiors until attains perfection.	-
T_{12} :Participating in curriculum development/revision and academic planning	M_2	Curriculum Development	M_{2a}: Curriculum development and evaluation	Involved in curriculum developmentand revision until masters the skills.	-
		Curriculum implementation	This to be cover in modules M_{1a} , to M_{1d}		-
T_{13}:Preparing and marking student assignments, essays, exams and providing feedback	M_3	Setting exams	M_{3a}: Principles of Assessment	Practice to set, administer and mark different assessments under supervision of superiors until attains perfection.	-
			M_{3b} : Assessing Knowledge, Skills and Attitudes	Practice to set and administer different assessments under supervision of superiors until attains perfection	-
		Giving feed back	M_{3b} : Giving feedback to students	Practice on different method of giving feedback under supervision of superiors until attains perfection	-
T_{14}Conducting tutorial sessions, seminars and laboratory classes (where relevant)	M_4	Same as main task	Skills gained through on the job training, there is no need of formal learning	-	On the job training no need of prior learning
T_{15}: Invigilating examinations	M_5	Same as main task	On job training	-	On job training

Key: - means not applicable

3.3.2 Research role

Research roles has five tasks Table 13 give a description on the task regarding which task require taught knowledge and which one require to practice without taught knowledge.The five tasks have resulted into 5 modules M6, M_7, M_8, M_9 and M_{10}.

Table 13:Module section for the Research role

Tasks	Module	Subtask	Knowledge required	Skills required after acquiring the taught knowledge	Require Practice without formal taught knowledge
T_{21}: Supervising the research and project work of Doctorate, Postgraduate and undergraduate students.	M_6	Same as main tasks	M_{6a} ,Student research/project supervision	-	on job training
T_{22}: Preparing bids for funding for departmental research projects and Managing research budgets	M_7	Proposal writing	M_{7a}: Project proposal writing	Mentored and practice proposal writing until attains perfection	-
		Project management	M_{7b}: Projects and grants management	Mentors on grant projects and management until can stand alone and manage projects and grants	-
T_{23}:Conducting further research into their specific field of knowledge/interest	M_8	Same as main tasks	Skills gained through on the job training and using skills gained in M_{9a} and M_{9b}	Conduct research under the supervision of superiors	-
T_{24}:Writing research proposals, papers and other publications	M_9	Same as main tasks	M_{9a} : Research methodology	Write research proposals and conduct research under a senior academics until they master research skills	On job training no need of prior learning
			M_{9b}: Publication	Co-publish papers with senior academics until we reach can publish individual papers	
T_{25}: Attend workshops / Conferences within and outside the university	M_{10}	Same as main tasks	-	-	Just need to attend minimum number of conference per year to help in improving the research and presentation skills.

Key: - means not applicable

3.3.3 Service role

Service roles has five tasks Table 14 give a description on the task regarding which task require taught knowledge and which one require to practice without taught knowledge. The four tasks have resulted into 4 modules M_{11}, M_{12}, M_{13}, and M_{14}

Table 14:Module section for the Service role

Tasks	Module	Subtask	Knowledge required	Require Practice After formal taught knowledge	Require Practice without formal taught knowledge
T_{31}: Advising the community on various issues	M_{11}	Same as the main tasks	Skills gained through on the job training and using skills gained in M_{1a}	On job training	On job training
T_{32}: Facilitating training for members of the community	M_{12}	Same as the main tasks	Skills gained through on the job training and using skills gained in M_{1a}, M_{1b} and M_{1c}	On job training	On job training
T_{33}: Offering service to the community like clinical services, outreach to a farmer or small business owner, etc.,	M_{13}	Same as the main tasks	Skills gained through on the job training and using skills gained in area of expertise	On job training	On job training
T_{34} :Administrative role in the institution	M_{14}	Same as the main tasks	M_{14} : Education leadership and Education	To be involved in leaders hip position such as units heads, sections heads, Head of Department	-

Table 12, Table 13, and Table 14 has described the tasks on the bases of what will be required on each task in order to help in improving the lecturer performance. The design of the modules will be based on the description given. From this description it shows that 6tasks will require on the job training and there will be no need of formal learning in order to perform the task to perfection. These tasks include: **T_{14}**Conducting tutorial sessions, seminars and laboratory classes (where relevant), **T_{15}**: Invigilating examinations, **T_{25}:** Attend workshops / Conferences within and outside the university,**T_{31}:**Advising the community on various issues, **T_{32}:** Facilitating training for members of the community, and **T_{33}:** Offering service to the community like clinical services, outreach to a farmer or small business owner. This means that out of the 14 tasks only 8 requires the formal learning and Table 15 present recalculated values for the proportional distribution of the course after removing tasks that do not require formal learning.

Table15:

Task	Weight
T_{11}:Preparing and delivering regular lectures for students	35.8%
T_{12}:Participating in curriculum development/revision and academic planning	9.6%
T_{13}:Preparing and marking student assignments, essays, exams and providing one-on-one feedback on academic performance where necessary	19.5%
T_{21}: Supervising the research and project work of Doctorate, Postgraduate and undergraduate students	4.0%
T_{22}: Preparing bids for funding for departmental research projects and managing research budgets	2.3%
T_{23}: Conducting further research into their specific field of knowledge/interest	13.3%
T_{24}: Writing research proposals, papers and other publications	8.9%
T_{34} :Administrative role in the institution	6.7%

3.4 Mode of delivery and Assessment of the PG Diploma

3.4.1 Mode delivery

We proposed that PG Diploma be delivered via an innovative e-learning environment incorporating a range of exciting interactive teaching and assessment techniques. These resources enable peer and tutor interaction and include podcasts, blogs, discussion boards, webinars, video clips, and formative feedback. We propose this because these are the lecturers that need not to leave their duty stations to go and study. Participants on these courses will be supported by an online introductory induction programme in order to promote familiarity with the tools, processes and facilities available to students during their academic journey. The programme willembrace the 'social' dimension of online courses by allowing the course participants, lecturers and administratorsto have regular contact with each other in order enhancing the learning experience (Shattuck, 2005). The course will be designed in a way that will help to nurture learning climate and caters for a variety of learning needs and styles. This should be done by using different

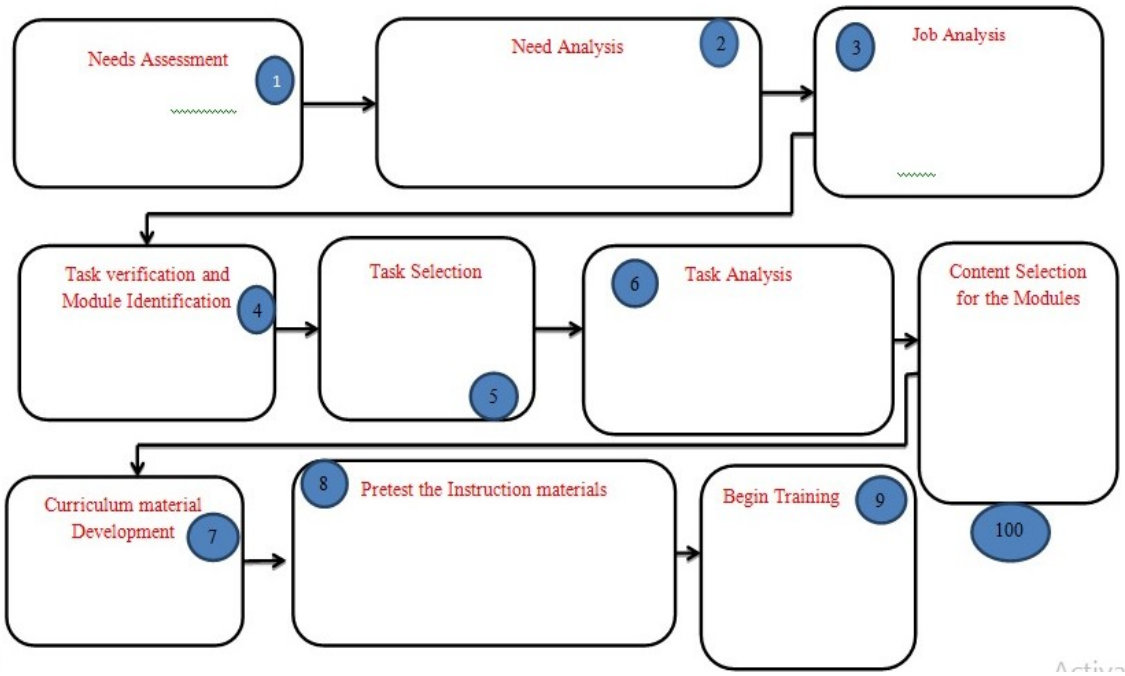
pedagogies in the delivery of the course. The course will also have one -2 days seminar in a month. This seminar will give an opportunity to course participants interact with the instructors and peer to peer physical interaction. Furthermore, online is favored in the delivery of this course because it is convenience and flexibility in the sense that course gives students the opportunity to plan study time around the rest of their day, instead of the other way around (Shattuck, 2005).In addition, students can study and work at their convenience. Course material is always accessible online, making special library trips unnecessary. All of these benefits help students balance work and family commitments with their education.

3.4.2 Assessment

Assessment is one of the most significant influences on a student's experience in education and it is a central feature of the curriculum (Liu, N. and Carless, D, 2006). Therefore the type and quality of assessment is of paramount importance in achieving the outcome of the curriculum. For this reason we proposed that each module should be assessed by written assignments, which will vary in number, length and task. Course participants will be encouraged to do self-review of their work in line with good pedagogical principles of assessment before submitting their work. Instructors' feedbackwill be formatively on this self-review and summative on the assignment, thus entering a feedback dialogue. This dialogue will also be used as a way to demonstrate to the participants how they will also be doing the same to their students.

The curriculum develop process for the proposed PG Diploma is summarized in Figure 5.

Figure 5:Curriculum development model for PD Diploma University Teaching for Malawi based on DACUM



Conclusion

Based on the pairwise comparison matrix in Table 7, AHP technique was applied so that effective decision can be done by curriculum development team in selecting best and appropriate modules for PG Diploma in university teaching based on the roles and task of the lecturer. We conclude that PG diploma will give the priority to task T11: Preparing and delivering regular lectures for students because this hasthe heights percentage. This implies that task T_{11}will have the highestportion of credit hours of the curriculum. Further, on content selection criteria we have found that priority preference is given to utility seconded by significant. Using DACUM and AHP we have come up with models for development of PDG Diploma in University Teaching for Lecturer in Malawi as shown in Figure 5. The modelproposed model has ten steps we have added a need assessment phase that will assist in identifying lecturer performance gap due to lack training in skills required perform the role or task. Pretest has also been incorporated as one step in the model. Pretest is necessary because the instructional materials need to be tested before rolling them to participants. Academics are a fragile group once the course fail to impress them on the first encounter with the course may develop an attitude towards the course.

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