
Development of a New Ergonomics-Based Technology Education Curriculum for Nigerian Universities: Needs Analysis

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ABSTRACT

In this study, a needs analysis was conducted to identify the ergonomics awareness among technology education lecturers in Nigerian universities. In addition, the study was also designed to determine the gap in the existing technology curriculum with regard to ergonomic integration across the technology programs in Nigerian universities. Also to determine the perception of lecturers toward the introduction of ergonomics-based technology education. Participants were 119 lecturers' of technology education from selected Nigerian universities. Data were collected using questionnaires. Descriptive statistics (mean and standard deviation) were used to analyse the empirical data. The main result indicates a low level of ergonomics awareness among technology lecturers in Nigerian universities. Also, with regards to the need of a new curriculum of ergonomics-based technology education, the study reveals that most respondents concur that a curriculum is needed. In fact, the majority of the lecturers perceived the incorporation of ergonomics-based technology education into technology education of the Nigerian universities as a milestone.

Keywords: Curriculum development, ergonomics, needs analysis, technology education

INTRODUCTION

The curriculum development using the needs analysis approach is simply refer to the identification of the gap or discrepancies exist and used as the basis for the curriculum development. Needs analysis can be define as a process to determine the reasons and causes for a need so that appropriate interventions may be identified and later selected (Triner, Greenberry, and Watkins 1996). Needs analysis in the curriculum/programme development may be multi-dimensional needs analysis or individual needs analysis, however educational researcher emphasizes the importance of needs analysis (Kjaer, Vedsted, & Hopper, 2017). Also, needs analysis is important for curriculum development because information about actual needs is required for development process of the program and can also help identify some of the implication and consequences that assist the curriculum experts (Grier, 2005). During the 20th century, a new field in technology domain called ergonomics or human factors was introduces into the literature by the Polish natural scientist W. B. Jastrzebowski in 1857 and the word ergonomics comes from the Greek ergo + nomos which simply the study of work (Karwowski, 2005). Ergonomics is often taught in engineering and technology programs at many universities across the globe. However, ergonomics

was lacking in technology education programs in Nigerian universities and this alarming situation is prolonging. Therefore, there is needs for an intervention to overcome the challenges and problems faced by technology educators in general and technology education students in particular.

Technology can be define as the way things are done or made (Society for the History of Technology, 2016). At international level, there is a call on the needs of vocational graduates to possess new skills so as to meet the new demands McCrone (2015) states that technology educators face significant skills gaps resulting from incomplete technical skills. Ergonomics as a field of study started in the industries and special agencies and raised to academia and scholarly research independent field of study. However, the term 'Ergonomics' is used interchangeably with 'Human Factor' and sometime it is combined as Ergonomics and Human Factors. Dul et al. (2012) states that ergonomics and human factors focus on the design of a system to suit humans physiology with their (working) environment. Ergonomics is derived from various fields in the human sciences and technology, including anthropometrics, physiology, psychology, toxicology, mechanical engineering, industrial design, information technology and management. The field of ergonomics arrives late in Nigeria and thus there is no so much available literature on the subject and this may be due to the absent of ergonomics as course of study in most of tertiary institutions. Even though in the early 1980s some literatures shows some evidence of researches in ergonomics in Nigeria such as the two unpublished MSc thesis by Nwuba in 1981 on "Human energy demand of selected agricultural hand tools" and Wagami in 1983 on "Selected ergonomic studies of commonly used manually operated farm tools". They are both from the Department of Agricultural Engineering, Ahmadu Bello University, Nigeria (Ismaila & Samuel, 2014).

According to Žunjić et al. (2015) there are three main segments in which ergonomics can contribute to the quality of education. These are: preservation of the health of students, creation of a comfortable working environment and adjusting the process of education according to students' abilities. Also, ergonomics played a vital role in design Dul et al. (2016) have pointed out effect of ergonomics design on performance and well-being that all ergonomically and technologically product consider human to be at center when it comes to design of product and result or outcome should be performance and well-being. Therefore, ergonomics as a programs or course of studies were in practice. However is lacking in the Nigerian universities. University programs must change to meet the needs of industry and students alike (Pickens & Benden 2013).

Having discussed about technology and ergonomics, the review will focus on the curriculum in general. It seemed that curriculum convey different connotation to different people. Finch and Crunkilton (1999) view curriculum as all of the experiences that individual learners have in a program of education whose purpose is to achieve broad goals and related specific objectives, which is planned in terms of a framework of theory and research or past or present professional practices. It is well known that curriculum is dynamics and needs continues reviews as the situation warrant, Mustapha (2010) suggested that curriculum should be review at various educational level and focus on process skills, incorporate a kind of "twitch speed" for learning as well as course or subject area contents should be review and outline for integration across disciplines. According to Cohen, Manion, and Morrison (2011), needs analysis can be used to identify program provision needs (and gaps in present provision). In another view needs analysis is the process of identifying gaps or

discrepancies between present and more desirable states of affairs, conditions or outcomes (English, 2005). In order to identify the relevant information for the development of the curriculum, Greenberg, et al (2016) utilizes a needs analysis to explore the contents and method of delivering of a bioethics curriculum for medical students. In addition the field analysis methods are the core of the needs assessment investigation if we decide to do it in a systematic way and to obtain data directly from the source (Sava, 2012). Empirical research studies in the fields of needs analysis in relating to development of curriculum or course program were numerous in both articles and thesis (Grier, 2005; Flowerdew, 2013; Horvat, & Kailer, 1989; Qiu, Wang, Lo, & Tsang, 2014; Boshier, & Smalkoski, 2002).

The process for needs analysis development shows in Figure 1 demonstrates the three stages namely: (i) Needs analysis planning and cause analysis (ii) Data collection and analysis (iii) Reporting and application. These stages will guide towards the conducting the needs analysis for the needs of ergonomics-based technology education in Nigerian universities.

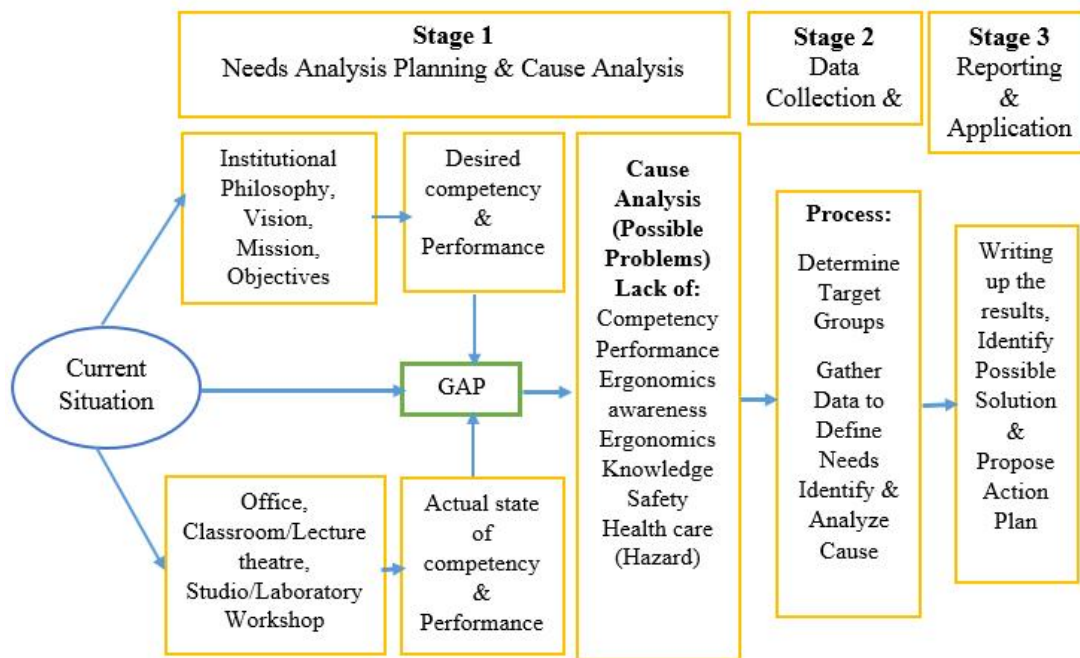


Figure 1. Process for needs analysis development

Thus, the purpose of this study is to identify level of ergonomics awareness among academic staffs in technology education and to explore the gaps that exist for the needs of ergonomics-based technology as well as to determine the perception of technology education lecturers towards the incorporation of ergonomics-based technology education in Nigerian universities.

METHODOLOGY

According to Piaw (2012), population is the entire group which will be studied. The population for the need analysis comprised all the lecturers of technology education in the selected

universities in Nigeria namely ATBU, MUT, FUTM and BUK. These universities are selected because they are the only federal universities from the northern Nigeria offering technology education. The sampling for the needs analysis in this study is a non-probability sampling or purposive sampling and is chosen because according to Gass (2012), purposive sampling is often used in needs analysis especially in the new development of curriculum. A sample of one hundred and thirty two (132) technology and vocational education lecturers was selected.

The instruments included questionnaires and open-ended. The data were gathered through questionnaire which consist of 3 sections namely: analysis of demography information, needs of ergonomics-based technology education and open-ended questions. As reported by Roberts, et al (2014) that one view of open-ended responses is that they provide a direct view into a respondent's own thinking. However it is unlikely the respondents would take time to put in their thought.

In this study, descriptive statistics of mean and standard deviation were used to describe the data where appropriate. Saunders et al. (2009) argue that data gathered have to be classified into groups before statistical analysis is carried out.

RESULTS

The population (N = 200) for the need analysis phase comprised all the lecturers of technology education in the four selected universities in Nigeria. A total of 132 questionnaires were distributed to the sample based on Krejcie and Morgan (1970) sample size table. The number of questionnaires returned were 119 (90.2%) out of 132 distributed and only 13 (9.8%) questionnaires were missing or not returned. The return rate is considered adequate for statistical analysis.

Needs analysis were used to answer questions one, two and three. The question was answered through questionnaires and open-ended. The questionnaires used 12 items and were rated on a 5 -points Likert scale. The open-ended questions finding was used to provide an in depth view of the technology education lecturers. In the section B of the questionnaires descriptive statistics such as means and standard deviation were used to describe the data where appropriate. Items 1 to 12 were analyzed and all items were rated on a 5-point Likert scale, with 1 = strongly disagree being as the lowest rating and 5 = strongly agree the highest for the participants agreement on the items. A concept of cut-off point of numbers for all items with participants agreement of strongly agree and agree of 80% of the respondents were in agreement was used. Also, mean scores of 3.41 and above were considered as strongly agree and agree, while any items with mean scores less than 2.61 were considered as disagree and strongly disagree respectively. Also to strengthening the decision, standard deviation below 1 were used. Standard deviation was used because it measures the spread or dispersion of distribution of scores. Mean and standard deviation scale ranges were adapted and modify from a previous related study (Mustapha, 1999; Mustapha and Norani 2007 & Mohd Puad, 2015).

Research Question One: What are the levels of ergonomics awareness among technology educators of the Nigerian universities?

Items 1 through 4 in Table 1 from the questionnaire (NAQ1-4) and the Need Analysis Interview Questions 2 (NAIQ 2) were addressed in research question 1. Table 1 showed the overall mean and standard deviation ($M = 4.40$, $SD = .39$) which indicated the respondents strongly agreed that they were aware about the importance of ergonomics-based technology education in Nigerian universities. For items 1, the lecturers strongly agreed ($M = 4.34$, $SD = .63$) that ergonomics awareness is needed among technology-based educators. Moreover, in items 2, the respondents were very eager ($M = 4.39$, $SD = .57$) to know more about ergonomics field. The importance of ergonomics-based technology to enhance technology educators' knowledge was strongly agreed ($M = 4.38$, $SD = .60$) by most of the lecturers [items 3]. Item 4 shows the lecturers strongly believe ($M = 4.49$, $SD = .55$) that an ergonomics-based technology curriculum will enhance technology education programs. Generally, standard deviations in all items are relatively small which indicated the homogeneity in the agreement.

Table 1: Ergonomics awareness among technology educators

Items	Mean	Standard Deviation	Interpretation (for the mean)
1. Ergonomic awareness is needed among technology-based educators	4.34	.63	SA
2. I will like to know more about ergonomics field	4.39	.57	SA
3. Incorporation of ergonomics will increase technology educators knowledge	4.38	.60	SA
4. I believe the ergonomics-based technology curriculum will enhance technology education programs	4.49	.55	SA
Total (Items 1 to 4) average	4.40	.39	

Research Question Two: What are the needs for the incorporation of ergonomics-base technology education into technology education programs of the Nigerian universities?

The research question two addressed the items 5 through 8 in Table 2 from the questionnaire (NAQ5-8), open-ended questions 1 through 3 (OQ 1-3) and the need analysis interview questions 2 through 5 (NAIQ3-5). The overall mean illustrates lecturers strongly agreed ($M = 4.24$, $D = .45$) on the needs to incorporate ergonomics into technology education programs in Nigerian universities. For item 5, respondents believed ($M = 4.24$, $SD = .68$) that ergonomics-based technology education is needed in order to produce competent technology education graduates. Also, lecturers concurred ($M = 4.32$, $D = .62$) that incorporation of ergonomics will improve their

employment opportunity [item 6]. For item 7, participants are convinced ($M = 4.34$; $SD = .63$) that the incorporation of ergonomics will broaden their technology educators' knowledge. In term of the quality of the technology education after incorporation of ergonomics-based technology education, most lecturers agreed ($M = 4.05$, $SD = .6$) that their graduates will be more marketable. Standard deviations were all within the range of below 1 ($SD < 1$) which shows the agreement among the respondents.

Table 2: Needs for the incorporation of ergonomics-base technology education

	Items	Mean	Standard Deviation	Interpretation (for the mean)
5.	The introduction of ergonomics-based technology education is needed to produce competent technology education graduates	4.24	.68	SA
6.	Incorporation of ergonomics will help technology educators' employment opportunity	4.32	.62	SA
7.	Incorporation of ergonomics will broaden technology educators' knowledge	4.34	.63	SA
8.	The introduction of ergonomics-based technology education is needed to produce marketable technology education graduates	4.05	.69	A
	Total (Items 5 to 8) average	4.24	.45	

Research Question Three: How do technology education lecturers perceive the introduction of ergonomics-based technology education in Nigerian universities?

Quantitative data were used to address research question 3 which included items 9 through 12 (NAQ 9-12). In general, the result demonstrates that the respondents supported ($M = 4.19$, $D = .47$) the introduction of ergonomics-based technology education in Nigerian universities. Regarding the participants' opinion on the introduction of ergonomics [item 9], they indicated strong agreement ($M = 4.47$, $SD = .64$) toward the integration of ergonomic-based technology curriculum. For item 10, on the incorporation of ergonomics-based technology, the lecturers concurred ($M = 4.18$, $SD = .64$) that it would make technology graduates more competitive. Also, the respondents acknowledged ($M = 4.03$, $SD = .77$) that they have interest to teach ergonomics in technology education program [item 11]. In addition, the lectures also agreed ($M = 4.07$, $SD = .67$) on the importance of making ergonomics as one of the areas of research interest. Generally, lecturers show their positive perception with regard to the introduction of ergonomics-based technology education in Nigerian universities.

Table 4: Perception on the introduction of ergonomics-based technology education

	Items	Mean	Standard Deviation	Interpretation (for the M)
9.	In my opinion, it is now time to introduce ergonomics/human factor in technology education	4.47	.64	SA
10.	The incorporation ergonomics-based technology education is needed in Nigerian universities so they could become competitive	4.18	.64	A
11.	I am interested to teach Ergonomics in technology education program	4.03	.77	A
12.	I would like to include ergonomics- based technology education as one the of areas of research interest	4.07	.67	A
Total (Items 9 to 12) average		4.18	.47	

CONCLUSION

The various conclusions can be drawn based on the results and discussion of the study. Lecturer of technology education identified the level of ergonomics awareness among technology educators in Nigerian universities is quite low and point out lack of ergonomics awareness as the barrier for the integration of ergonomics-based technology education . Even though lecturers divulge their readiness and welcome the ideas for the incorporation of ergonomics. Looking into consideration of the importance of acquiring new skills in technology education so as to enhance skills and matching the present demands both in technology and industries this coincided with Mustapha, (2017) view that skills gap could be reduced by enhancing skills matching via choosing relevant technology education programs. Moreover, the study explored that lecturers believe there is needs of ergonomics-based technology education incorporated into technology education programs of the Nigerian universities based on the needs analysis finding. Several factors were identified as the reasons for the needs of ergonomics-based technology education by lectures such as the incorporation of ergonomics will enhance technology education. Also provide employment opportunity, broaden technology educators knowledge and to produce competent graduates. It has been confirmed that ergonomics-based education technology would improve design technology, creativity, thinking skills as well as skills acquisition.

In addition the study determined the perception of technology education lecturers towards the introduction of ergonomics-based technology education in Nigerian universities which revealed widely accepted and perceived it as a milestone in the development of technology education in Nigeria in general. Thus, the key finding shows there is an urgent need to propose a new curriculum of ergonomics-based technology education in Nigerian universities.

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