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 such as means and standard deviation were used to describe the empirical data. The main result indicated a low level of ergonomics awareness among technology education lecturers in Nigerian universities. Also, with regards to the need of a new curriculum of ergonomics-based technology education, the study revealed 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.

1. Introduction
The curriculum development using the needs analysis approach simply refers 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 [1]. 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 [2]. 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 [3]. 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 [4]. 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.

Technology can be defined as the way things are done or made [5]. At international level, there is a call on the needs of vocational graduates to possess new skills so as to meet the new demands. [6] 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. [7] states that ergonomics and human factors focus on the design of a system to suit humans’ physiology with their (working) environment. 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 show 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 [8]. Therefore, due to market demands the university programs must change to meet the needs of industry and students alike [9]. 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 [10] view that skills gap could be reduced by enhancing skills matching via choosing relevant technology education programs.

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. [11] 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, [12] suggested that curriculum should be reviewed 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 [13], 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 [14]. In order to identify the relevant information for the development of the curriculum, [15] utilizes a needs analysis to explore the contents and method of delivering of a bioethics curriculum for medical students. 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 [3]; [16]; [17]; [18]; [19].

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 of the needs analysis for the needs of ergonomics-based technology education in Nigeran universities.

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.
2. Methodology

2.1. Participants
According to [20], 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. This 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 [21], 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.

2.2. Instrumentation and Data Collection
The instruments used was questionnaire. The questionnaires used 12 items and were rated on a 5-points Likert scale. The data were gathered through questionnaire which consist of analysis of demography information and needs of ergonomics-based technology education questions. A questionnaire is relatively economical and can ensure anonymity [22].

2.3. Data Analysis
In this study, descriptive statistics such as frequency, percentage, means and standard deviation where used to describe the data where appropriate. [23] argue that data gathered have to be classified into groups before statistical analysis is carried out.

Figure 1. Process for needs analysis development.
3. 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 [24] 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.

Need analysis questionnaires were used to answered research questions one, two and three. In 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, a standard deviation below 1 was 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 modified from a previous related study [25]; [26] & [27].

3.1 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) 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 item 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 | |
3.2 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). The overall mean illustrated 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                             |


3.3 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). Table 3 displays the transcription of the lecturers’ perceptions on the introduction of ergonomics-based technology education. 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 [item11]. 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 3: 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 of the areas of research interest | 4.07 | .67                | A                         |
| Total (Items 9 to 12) average                                         | 4.18 | .47                |                           |

4. 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. 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.

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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