Evaluation of upper basic Home Economics examination questions and possible relationship to students' cognitive thinking levels

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Abstract
The study determined if achievement in Home Economics is consistent with students' cognitive thinking levels. The study design is descriptive survey. All students from schools offering home economics at junior secondary school (upper basic) level in three senatorial districts of Benue State, Nigeria formed the population. The instruments used for data collection were the home economics achievement test (HEAT) and the cognitive reasoning task (CRT). The findings indicated that concrete reasoning is more noticeable than formal reasoning among participants. The findings revealed that there is a match between the students' cognitive reasoning level and the cognitive demand of examination questions. It was also revealed that there is no relationship between students' performance in HEAT and their measure of cognitive thinking ($r=0.036$; $p=0.528$). The agency responsible for curriculum planning and development needs to strengthen the link between both cognitive demand of home economics examinations and students' cognitive thinking level.

Keywords: cognitive demand of examination; concrete thinking levels; home economic achievement test; upper basic students.

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1. Introduction

Home Economics Education is that educational process which prepares students for a successful family and community living. It is a form of education that impacts in man all round successful development. This is aimed at improving man's quality of life (Khaleel 2012). According to International Federation of Home Economics (IFHE, 1988), "Home economics is both the body of theoretical knowledge based on exact science and humanities and form of practical, backed up by appropriate technologies". Its area of activity is the development use and management of human and material resources for the greater welfare of individuals, families and humanity in its entirety".

Upper Basic home economics curriculum should be diversified so as to cater for difference in talents and to anticipate the variety of opportunities open to the student after completing their course of study. The upper basic curriculum for home economics (HE) is spread between junior secondary school (JSS) 1-3. The curriculum reflects depth appropriateness and interrelatedness of the contents. Emerging issues which cover value orientation, peace and dialogue including human right, education, family life, HIV and AIDs education are included in the contents. The contents of the curriculum are also organized around theme, HE and society, good grooming, family living, managing the home, introduction to clothing construction and clothing the family and feeding the family (Ikwuansi, 2011).

As stated in the National Policy on Education (FRN, 2005), the objectives of teaching home economics at upper basic level are to contribute to a healthy family, develop and manipulate skill that will enable the learners to function effectively in the society; develop a sense of inquiry and scientific approach for daily living and appropriate dignity of labour. Secondary education has been acknowledged as preparation of the child for useful living within the society and preparation for higher education (FRN, 2005). Any inadequacy at this level will likely adversely affect the child's learning and living within the society.

One way to determine the extent to which the objectives of HE are achieved is to ascertain the level of cognitive reasoning skills of learners as reflected in their performance in the subject. Kurtz and Karplus (1979) define cognitive reasoning ability as cognitive processes by which people start with information and come to conclusions that go beyond that information. Several scholars (Nkwo, Akinbolola & Edinyang, 2008; Akpan, 2007) have identified cognitive reasoning ability as a major determinant of academic achievement. Effective learning requires students to be able to transfer their knowledge of basic concepts in a subject area to a non-routine problem situation. That is, the transfer of prior learning to a new context using higher order thinking skills. Some scholars agree that the conceptual demands of science curricular at the lower level of education and students' cognitive development level is an area of research that has received little attention (Stylianides, Stylianides & Shilling-Traina, 2013; Wiersma & Jurs, 2005). To the researchers' knowledge, the conceptual demands of HE achievement in relation to the cognitive thinking levels of JSS students in Nigeria, is yet to be explored.

Ozoji and Mankilik (2015) assessed the conceptual demands of the basic science curriculum and students' cognitive development level in Plateau State, Nigeria. The result of the study showed that 64% of the concept in the basic science curriculum was understood by the conceptual demands of the integrated science curriculum and students' cognitive development. Adache (2006) carried out a research to assess the business education curriculum at National Certificate in Education (N.C.E) level in line with the ideal business education curriculum. The results indicated that the contents should be strengthened and it should be exposed to modern office equipment in order to allow graduate to meet the challenges of the new revolution in the world of work. The study shows mismatch between the N.C.E Business Education curriculum and the ideal business education program. There is little relationship between the curriculum of business btudy with the ideal Business Education program. For there to be an expected relationship, the curriculum should be strengthened to fit into the business program.

Home Economics curriculum has undergone several changes and a lot of modification since the advent of this innovation. It is not known whether the home economics curriculum at Upper Basic level has been evaluated to determine its relationship with the cognitive thinking levels of students as well as the examination questions of the subject. When that is not done, the likelihood of a gap in quality of the learners may be there. Furthermore, poor performance in the junior secondary certificate examination (JSCE) in HE in recent times (2005 to 2014) (Samba, Achor & Ejeh, 2020; Udonwa, 2015) is a cause for concern. This study therefore, seeks to examine the extent to which upper basic home economics examination question is consistent with the Students Cognitive thinking levels. The Cognitive demands of HEAT should reflect the philosophy of home economics at this level of education if the objectives of the subject are to be fully realised. That is, the cognitive thinking levels of students should be consistent (match) with the philosophy of the subject. To the researchers' Knowledge, there are no studies that investigated this problem, but several studies have been conducted in other subject areas (Adache, 2006; Achor etal.,. 2015).

1.1 *Purpose of the Study*

The main purpose of this study is to assess the Upper Basic home economics examination questions and Students Cognitive reasoning in order to determine if there is match or mismatch. Specifically, the study will also:

1. Assess the pattern of cognitive thinking among upper basic level students in Benue State ;
2. Estimate the conceptual demands of the Home Economics examination Questions;
3. Compare the level of match or mismatch between Home Economics examination questions and Student's Cognitive thinking levels;
4. Determine the relationship between Students' performance in HEAT and their measures of cognitive reasoning.

2. Materials and Methods

The present study employed descriptive survey design, specifically ex-post-facto to generate data on the relationship between the independent and dependent variables.

2.1 Participants

A total of 310 upper basic secondary school students from three Senatorial districts of Benue State, Nigeria were selected to participate in the study using multi-stage sampling procedure. During the first stage, nine schools were randomly selected by balloting from each of the three Senatorial zones (three schools from each zone). Thereafter, systematic random sampling technique was used to select the 310 participants. In this technique, every 5^{th} student from the class register in each sampled school was selected to participate in the study.

2.2 Instruments for data collection

The HEAT comprised 60 items sampled from (JSCE) organized by the National Examination Council (NECO) past question papers. The test consisted of multiple choice items based on the three-year junior secondary school (JSS) curriculum. The total score for the HEAT was 60 marks, with each item attracting one point. The CRT comprised 15 items with short answers and it was adapted from Science reasoning task II (SRT) developed by the Team Concepts in Secondary Mathematics and Science at Chelsea College University of London in the early 70's (Shayer, Kuchemann & Wylam, 1976). The CRT was developed to examine the relationship between optimum Piagetian level of reasoning and the level of achievement which a student can demonstrate in science. All items were science-related. Home economics is an applied science course, therefore students offering it have science background. The test is therefore considered appropriate for participants.

In order to determine the reliability of the data collection instruments and refine test administration procedure, a pilot test was conducted using 30 JSS students who were not part of the final study sample. The Kuder Richardson technique was used to calculate the reliability using the Statistical Package for the Social Sciences (SPSS Version 20.0, Chicago, IL, USA). The reliability coefficients of 0.94 and 0.86 were recorded for HEAT and CRT respectively.

2.3 Data Collection

Data collection lasted for a period of four weeks. The teachers whose classes were used for data collection served as research assistants. The first week was used to familiarize the research assistants with test objectives and administration procedures. They consisted of home economics and science teachers. They were university graduates with at least two years teaching experience. The remaining three weeks were used for test administration. Both tests were administered during regular home economic classes. The HEAT was administered in the first two week while the CRT was administered during the remaining weeks of data collection.

2.4 *Data Analysis*

Descriptive statistics of frequency, percentage, mean and standard deviation were used for background information, level of CRT and achievement in HEAT. Whether there is match or mismatch between the independent and dependent variable is determined by performance range between the two variables. There is a match if the difference in performance between the two variables is 10% or less. Otherwise, it is a mismatch. The Rasch scaling (Masters, 1982) was used to

categorize participants into concrete reasoning and formal reasoning levels. A score from 3.0 to 6.0 on the scale places a student at concrete reasoning level while scores from 7.0 to 9.0 classifies a student at formal reasoning level. The zero-order correlation coefficient was used to test the relationship between the dependent and independent variable. All tests were conducted using the SPSS statistical software at an alpha level of 0.50.

3. Results

Four research questions based on the study objectives guided the study and relevant data are presented as follows:

Table 1 Pattern of cognitive development among upper basic level students in Benue State.

Reasoning level	Frequency	Percentage
Concrete Reasoning	244	78.7
Formal Reasoning	66	21.3
TOTAL	310	100.00

Table 1 shows the pattern of cognitive development among upper basic students in Benue state. The Table indicates that out of 310 upper basic level students, 78.7% of the students demonstrate concrete reasoning level while 21.3% are of formal reasoning level. The percentage ratio of concrete to formal is therefore 4:1. The result shows that the concrete reasoning level of cognitive development is more predominant than formal reasoning level of cognitive development among upper basic level students.

Result of conceptual demands of Home Economics JSC examinations indicates 83.2% of participants exhibit concrete reasoning level, while only 16.8% demonstrated formal reasoning level (figure 1).

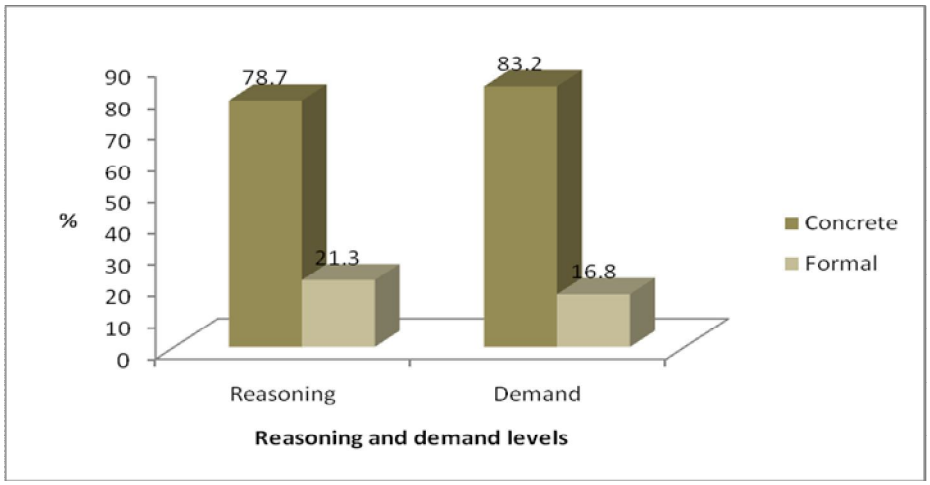

Figure 1: Compatibility of cognitive reasoning and demand levels of participants in JSS HE examination

Figure 1 indicates the matching of cognitive reasoning and demand levels of participants. Match or no match is determined by how close or far are the performance differences. There will be a match if the difference in performance between the levels of reasoning and demand is less than 10%. As clearly shown in Figure 1, performance of participants operating at concrete reasoning level of 78.7% matches the demand level of upper basic examination questions of 83.2%. Similarly, performance of those operating at formal level of 21.3% is compatible with the demand level of examination questions of 16.8%.

With regard to the relationship between students' performance in HEAT and their measure of cognitive reasoning, data analysis revealed a non-significant ($p=0.528$) correlation coefficient of 0.036, indicating no relationship. Further analysis showed that participants' cognitive reasoning levels accounted for only 0.1% of their performance in HEAT.

4. Discussion

Success in the learning and retention requires the ability to reason (Nkwo et al., 2008, Akpan, 2007; Achor, 2005). Despite this evidence, the importance of cognitive reasoning ability on home economics achievement has not been fully explored, especially among Nigerian students at the junior secondary school level. As teachers, it is important to determine the relationship between the levels at which our students function and their academic achievement based on their understanding of the subject matter. This is important in ascertaining the effectiveness of the curriculum as well as monitoring learners' progress. One of the testing instruments used to achieve this purpose was the Science Reasoning Task II (SRT) developed by the Team Concepts in Secondary Mathematics and Science of the Chelsea College University of London (Shayer et al., 1976). This approach was an extension of the work of Piaget (1956) which evaluates the relationship between the optimum levels at which a learner can function and his achievement. Thus, the use of this approach in the present study is relevant.

The results of the present study indicated that a preponderance (78.7%) of upper basic level students in Benue State operate at concrete reasoning level of development. This implies that the concept of conservation, differentiation, classification and ordering are predominant among upper basic students than the ability to generalize an abstract from their experiences of various sorts. This means that students at that level in Benue state have ability to conserve, differentiate, and to classify knowledge from the ability to generalize and abstract knowledge from their experiences. This result is in agreement with that of Achor (2003) who reported that a large proportion of secondary school students operate below the formal operational level of thought. Our findings are also in agreement with those of Tajudin and Chinnappan (2016). Using a cohort of 351 upper secondary school Malaysian students aged 16 to 17 years, these investigators found 94.0% of their sample in the concrete reasoning level.

Findings from this study also showed that the conceptual demand of HE examination questions is slanted more toward students operating at concrete reasoning level. This implies that the JSCE home economics questions are conceptually loaded with questions that demands learners to develop logical thinking using concrete objects.

Findings of the study indicate that there is a match between students' cognitive reasoning level and the conceptual demands of the home economics examination questions. These findings are in agreement with that of Ozoji and Makilik (2015) who found that a relationship existed between the conceptual demand of the integrated science curriculum and students' cognitive development level. But the findings do not agree with that of Adache (2006) who found out that the NCE Business Education curriculum Contents should be strengthened and it should be exposed to modern office equipment. This implies that there is mismatch between NCE business education curriculum and the ideal business education Program.

5. Conclusion

Based on the findings of the study, the following conclusions were drawn:

1. There is a match between the demand of upper basic JSCE in home economics and students' cognitive thinking level.
2. Upper basic students in Benue state operate below the formal operational level of thought. This implies that, they are more of concrete reasoning level than formal levels.
3. Upper basic Home economics questions are conceptually loaded with questions that demand the learner to develop logical thinking using concrete objects.
4. Finally, the study indicates that there is no relationship between students' performance in HEAT and their measures of cognitive reasoning.

6. Recommendation

Based on the findings of this study, the following recommendations were made:

The agency responsible for curriculum planning and development and examination bodies should strengthen the existing link between cognitive demands of Home Economics Curriculum, its examination questions as well as students' cognitive reasoning level. Further research in this area is warranted.

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Conflict of Interest

The authors declare no conflict of interest

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