Scottish Journal of Arts, Social Sciences and Scientific Studies - ISSN 2047-1278
http://scottishjournal.co.uk

SCOTTISH JOURNAL OF ARTS, SOCIAL SCIENCES AND SCIENTIFIC STUDIES

VOLUME 23, ISSUE I
DECEMBER 2014

Articles

Scottish Journal of Arts, Social Sciences and Scientific Studies - ISSN 2047-1278
http://scottishjournal.co.uk

Factors Affecting the Science Ability of 15-Year-Old Indonesian Students Based On Pisa Study

Burhanuddin Tola
State University of Jakarta
Email: Burhanuddin.tola@gmail.com

Abstract

This study aims to determine the factors that affect the science literacy ability of 15-year-old students by adopting quantitative analysis model approach. The study samples were 15-year-old students from schools in Junior High School (SMP), Islamic Junior High School (MTs), Senior High School (SMA), Islamic Senior High School (MA), and Vocational High School (SMK). The total sample students are 10.647 15-year-old nationwide SMP, MTs, SMA, MA, and SM). The instrument of data collection was developed by ACER in the form of science literacy tests, student poll, and principal poll. There were15 indicators of student poll and 5 plausible scores of science test in Program for International Student Assessment (PISA) that were tested with modeling structural equation. Latent variable which is formed from 15 indicators is a career relating to science, time to learn science, students' background, learning or teaching strategies, and attitude toward science. The result of the research shows that: (1) the grade of science students' ability is affected positively by students' attitude and parents' education background, (2) the science ability is negatively correlated with a strategy based on the problem, the use of the phenomenon to illustrate the topic, and laboratory investigation, but it is positively correlated with the cooperative and modeling strategy, (3) the grade of students' attitude is positively affected by students' desired job, learning activities at class, and parents' educational background, and (4) and self-confidence and study motivation in learning science are positively correlated with the science ability, the more confident and motivated the students are to learn science, the more ability the students will get.

Keywords: students' science ability, factors that affected science ability, PISA

In 1997, OECD launches Program for International Student Assessment (PISA). PISA aims to monitor the results of an education system that is concerned with the study for 15-year-old students. Besides, PISA is designed to help the government not only understand it but also improve the effectiveness of the education system. PISA gathers reliable information every three years. The findings of PISA are used such as: (a) to compare the literacy of reading, math, and science that the students have in one country to others; and (b) to understand the strength and the weakness of the education system in each country (Thomson & De Bortoli, 2008).

In 2000, PISA did the first assessment in 32 countries. The focus of the first assessment was reading literacy, added with a little literacy of math and science. In 2003, PISA was carried out in 41 countries. The focus of the second assessment was Math literacy, added with a little literacy of reading and Science. PISA 2003 included also the assessment of Problem Solving skill curriculum. The 2006 PISA completed the first cycle, with the main focus on science literacy, added with a little literacy of math and reading .

Science literacy is a major domain in PISA 2006, that previously became minored domain in PISA 2000 and 2003. The successive scores of the science literacy for Indonesian students were 393, 395; and 395 for the year of 2000, 2003, and 2006, also the TIMSS Indonesian results were relative the same (Martin, M.O., Mullis, I.V.S., & Foy, P., 2008). The average score of all contracting states was 500 with byway 100. The low scores mean that the Indonesian students have limited knowledge of science. The low score of science literacy reflects the general phenomena that the achievements of science learning for Indonesian students are bad. It raises the question for the science teachers and policymakers: why can it happen? Which factors cause low achievements of science? What is the implication for learning process, curriculum, and school?

A lot of attention has been given to design effective teaching and learning of science. Some teaching strategies could improve the achievement of science study. The internet, the use of active learning strategy effectively can improve the ability of students in biology (Johnson & Stewart, 2002). Also, it is reported that the use of cooperative learning strategies can improve performance and learning active in quantitative skills (Yuretich et al., 2001). The use of active learning exercise focused on the development of the discovery of science can give students the framework of cognitive combine information science (Gorman et al., 1998). In addition, students in learning of science based problems have standards of higher test scores than students in traditional classroom (Schneider et al., 2002). The researches have been done in developed countries, while in Indonesia of research results obtained similar difficult. This study tried to obtain information about the relationship between the strategy of learning and teaching science and the science ability of students in Indonesia based on 2006 data PISA.

Besides providing science literacy information, PISA data also provides the information of students' family background, attitude toward science, and the strategy of learning and teaching that students inserted in the poll. The data interpretation of and information and science ability in students' books poll can help us understand the factors that affect the ability of students' science.

The science literacy framework of PISA 2006 consists of four aspects relating to students' tasks; students' competency; domain knowledge; and students' attitude. The framework is shown in Figure 1.

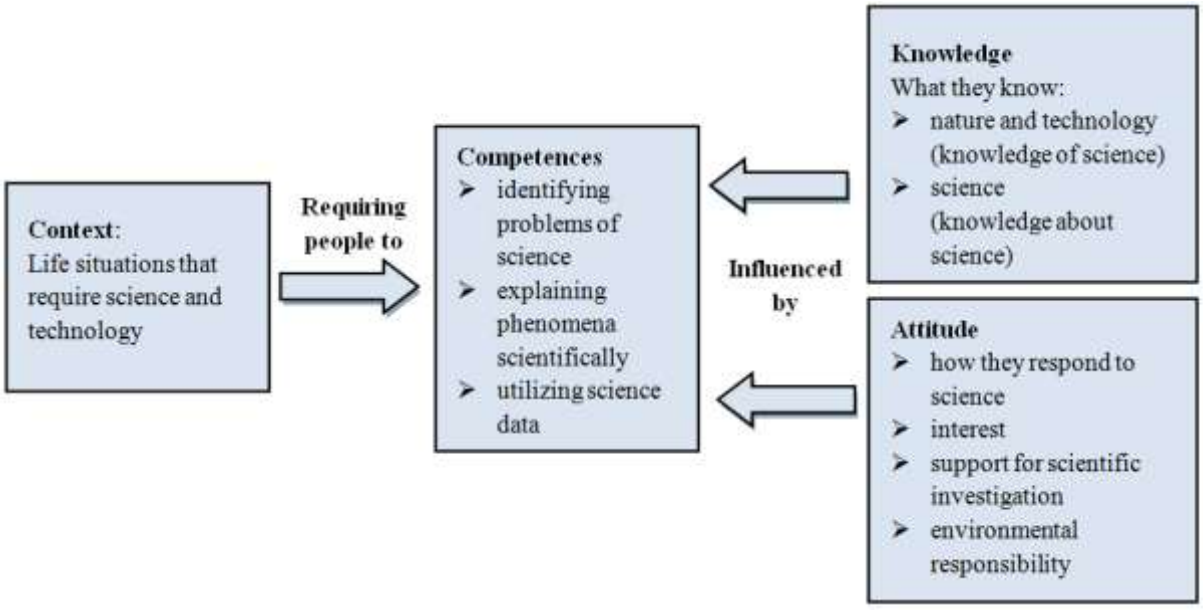


Figure 1. A PISA 2006 Science Assessment Framework (OECD, 2007, h. 35)

PISA orientation is preparing students for their future, so items in the PISA science assessment is associated with real life. In the PISA 2006 science assessment, the focus of the items is attributed to a person, family and friends (personally) with the community (social) and with the life all over the world (global life).

This research aims: a) to test the constructive dimension of science learning and teaching strategy in PISA 2006 data so that Indonesian students use the analysis technic of confirmatory factors; b) to test the constructive dimension of students' attitude on science from PISA 2006 data so that Indonesian students use the analysis technic of confirmatory factors; c) to analyze a causal relation between the variables of students' background, learning and teaching strategies, students' attitude toward science, and students' ability to know the direct and indirect influence; and d) to test the diagram model of the factors that affect the science ability of using a analysis technique of confirmatory factors.

Methods

The subject of the research is 15-year-old students from schools in Junior High School (SMP), Islamic junior high school (MTs), Islamic Senior High School (MA), and Vocational High School (SMK). The sample total is 5.330 junior high school students, 926 MTs students, 2.638 high school students, 240 MA students, and 1.513 SMK students. The number of all samples is 10.647 students.

PISA 2006 assessments have a test of science literacy with various test format, a students' poll, and a principal's poll. This study uses a test of the students' ability and the students' poll. All PISA assessments use writing tests. Students were given a stimulus (test items) requiring them to give their responses to the stimulus. It was used a variety of the test formats to access the range of cognitive ability and knowledge.

The students' questionnaire of PISA 2006 consists of 37 parts. The questionnaire consists of a question on a career dealing with science, a question on a duration time used to study sciences, a question on students' background, a question on students' attitude, and a question on the strategy of science learning and teaching. The majority of grains are related to the question on students' attitude toward science. Each grain generally has four alternative answers.

There are 15 indicators in students' poll and 5 plausible scores in PISA science test that was tested with structural equation modeling. The latent variable which was established by 15 indicators is a career relating to science, time to learn science, students' background, learning/teaching strategy, and attitude toward science. A diagram of the relation between variables is shown in Figure 2.

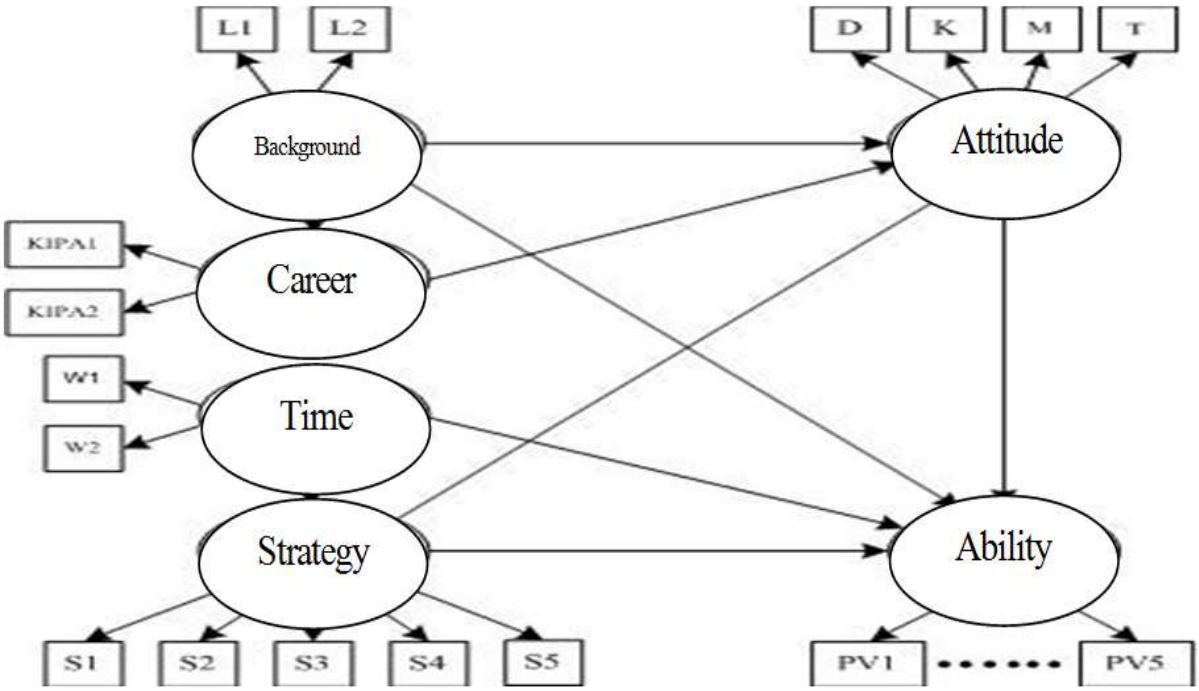


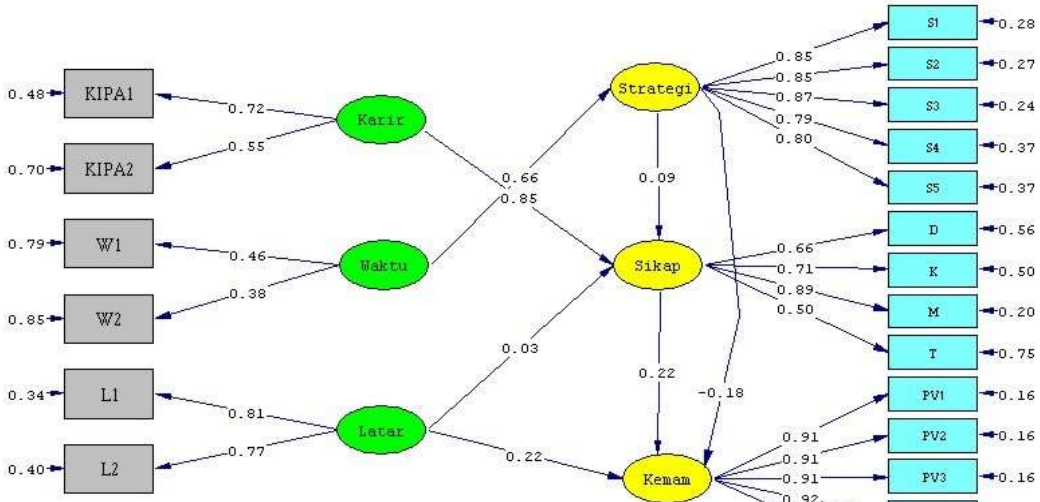
Figure 2. A Model of Diagram

LISREL gives some indexes of conformity, that is Root Mean Square Approximation (RMSEA), Comparative Fit Index (CFI), Normed Fit Index (NFI), Non-Normed Fit Index (NNFI), Goodness of Fit Index (GFI),and Adjusted Goodness of FitIndex (AGFI). If a model is in accordance with the data, the index of conformity should meet certain conditions .

Result and Discussion

Overall there are 15 indicators in students' poll and 5 plausible scores in science ability that was tested with structural equation modeling. Descriptive statistics of these indicators are listed in appendix. The latent variable that is formed by the 15 indicators and the plausible score is: (1) students' background (background), (2) the career pertaining to science (career), (3) time to study sciences (time), (4) science teaching and learning strategy (strategy), (5) attitude toward science (attitude), and (6) students' science ability (ability).

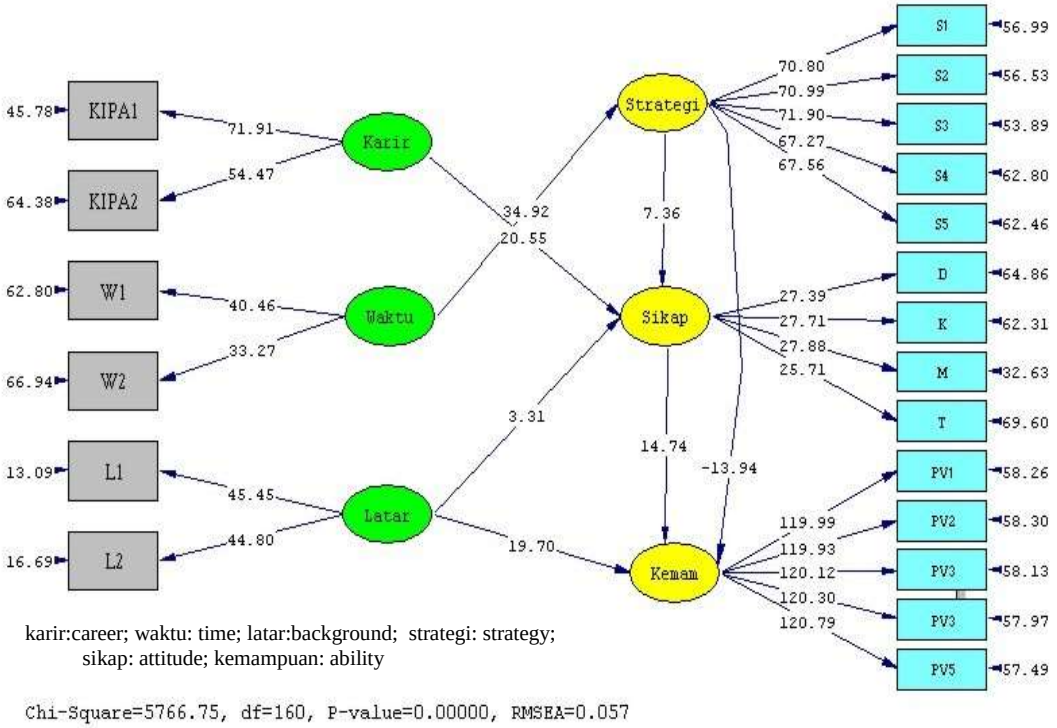
This research uses a matric correlation of the indicators as an input of structural equation modeling. The matric correlation was put into a syntax file of LISREL program. A diagram resulted by the execution of the LISREL program is shown in figure 3 and 4. The result of the parameter estimation is concluded in table 1. The decomposition of influence between variables is concluded in Table 2.



karir:career; waktu: time; latar:background; strategi: strategy;
sikap: attitude; kemampuan: ability

Chi-Square=5766.75, df=160, P-value=0.00000, RMSEA=0.057

Figure 3.An estimation of the Lane Analysis Parameter attitutede



karir:career; waktu: time; latar:background; strategi: strategy;
sikap: attitude; kemampuan: ability

Chi-Square=5766.75, df=160, P-value=0.00000, RMSEA=0.057

Picture 4. Lane Analysis Statistic

Table 1. A Summary of the Parameter Estimative Result (Standardized, n = 10.647)

Model	Coefficient Lane	T	R2
Ability			
Attitude→Ability	0,22	14,74	0,092
Strategy→Ability	-0,18	-13,94	
Background→Ability	0,22	19,70	
Attitude			
Career→Attitude	0,85	20,55	0,82
Strategy→Attitude	0,093	7,36	
Background→Attitude	0,033	3,31	
Strategy			
Time→Strategy	0,66	34,92	0,43

Table 2. A Decomposition of the Influence between Variables (Standardized, n = 10.647)

Effect among Variables	Effect				Total
	Direct	Indirect through			
		Strategy	Attitude	Strategy and Attitude	
Attitude→Ability	0,22	-	-	-	0,22
Background→Ability	0,22	-	-	-	0,22
Time→Ability	-0,66)	(0,66)	-	(0,66) (0,09) (0,22)	0,1318
		(0,18)			
Strategy→Ability	-	-	(0,09)	-	0,0198
			(0,22)		
Time→Strategy	0,66	-	-	-	0,66
Career→Attitude	0,85	-	-	-	0,85
Background→Attitude	0,03	-	-	-	0,03
Strategy→Attitude	0,09	-	-	-	0,09
Time→Attitude	-0,66)	(0,66)	-	-	0,0594
		(0,09)			

The level of students' science ability (ability) is positively influenced by the students' attitude toward science (attitude) and parents' educational background (background). The size of the attitude influence toward the ability is (0.22)2 or 4.84 percent. The size of the background influence toward the ability is (0.22)2 or 4.84 percent. The size of time indirect influence toward the ability is (0.1318)2 or 1.73 percent. The level of learning activities in the class (strategy) is positively influenced by the time duration that is used to study sciences (time).

The size of time influence toward the strategy is (0.66)2 or 43.56 percent. The level of students' attitude toward science (attitude) is positively influenced by the career that students desired (career), learning activities in the class (strategy), parents' educational background (background), and the time duration that was used to study sciences (time). The influence size of the career, the strategy, the background, and time is (0.85)2 + (0.03)2 + (0.09)2 + (0.06)2 or 82 percent.

The students' science ability has a negative and significant correlation with learning activities in the class (strategy). The coefficient of the correlation is -0.18 and the score is -13.94. The science literacy correlation with the phenomenon that is illustrating topic, learning based on problems, and lab research has a negative grade. But the science literacy correlation with the cooperative and modeling system has a positive grade. The students' poll is scaled in such a way because the low scores are unfavorable toward the statement in the poll and the high scores are favorable toward the statement.

The proper test aims to evaluate whether the proposed measurement models are fit to the data or not. In this case, the measurement model will be fit to the data if the model can estimate the matric of population covariance that is different from the matric of sample data covariance. The model of the proper test uses some indexes of the propriety. The results of the proper test are concluded in Table 3. If a model is in accordance with the data, the proper index will be in a certain range. The range is given in Table 3. If all propriety indexes meet the received criteria, the model will meet the criteria.

Table 3. Propriety Indexes and Criteria

Congruent Index	Value	Criteria
RMSEA	0,057	< 0,08
CFI	0,96	> 0,90
NFI	0,96	> 0,90
NNFI	0,96	> 0,90
GFI	0,95	> 0,90
AGFI	0,93	> 0,90

One of the largest relations in the model is found between the students' science ability and parents' educational background. Although parents' education does not depend on science teaching, it has more impact on the science ability rather than the influence of the teaching activities. An educated family environment has a positive impact on students' academic performance. The program of the family support would get students learn more diligent at home or at school.

It is surprising that there is a negative correlation between the science ability and other indicators of science learning. The correlation between science literacy and the indicators of the phenomenon use illustrating a negative topic shows that students which are unfavorable toward the indicator statements have the science score higher than students which are favorable. The correlation between science ability and study indicators based on the negative problems shows that the students who like that strategy have science scores lower than those who dislike the strategy. The correlation between science literacy and the indicators of the lab research has a negative value, it shows that the students who rarely use the strategy of the lab research have science score higher than those who often use the strategy. The correlation between science ability and cooperative indicators has a positive value, it means that the students who frequently use cooperative strategy have science scores higher than students who rarely use the strategy. The correlation between science literacy and modeling strategy has a positive value, it means that the students who like teacher modeling have science scores higher. They are happy when teachers do displays and give instructions while they do an experiment.

The negative correlation between the science ability and student-centered class activities is in accordance with some researches. Leung (2002) found a negative correlation between the science achievement and the student-centered learning process in southeast Asian nations. House (2005) said that based on TIMSS 1999 data, in Japan, Hong Kong, and Taiwan, students who often use cooperative learning strategy (working together in small groups to do a project or to solve problems) have low scores of science test. Considering the researches and their findings, it is said that in the traditional systems, a new teaching and learning method should be implemented carefully by considering the expectations of teachers' and students' quality.

The analysis shows that teacher-centered class activities have a positive influence on the students' science ability. Students and teachers, who completed the test and explained science topics, are successful in PISA. The achievement test of PISA seems right to access the result of teacher-centered teaching. Another explanation is that the teacher-centered teaching environment is probably in accordance with our culture. The result shows the importance of teachers' role and methods which they use at class.

The other important factor affecting the science ability is students' attitude toward science. In PISA 2006, students' attitude toward science includes the support to science, the confidence, the interest of science, and the responsibility on the environment. In the analysis, self-efficacy and students' motivation to learn science are investigated deeply. All of responses from the poll grains of self-efficacy and motivation are positively correlated with a score of the science ability. Students who have high confidence and motivation will have the high ability score. Students who get the high scores of the test tend to have a more positive attitude toward science. The result shows the conformity of the findings from Patrick et al. (2007), Glynn et al. (2007) which stated that the motivation is affecting the achievement of science learning very much. In addition, the results is also consistent with the findings from the international study of TIMSS 1999 and TIMSS 1995 (House, 2004). Papanastasiou Zembylas (2004) said that bad science achievement can be improved through stimulating students' positive attitude toward science.

Conclusion and Advice

Based on the result of the research, research conclusions are summarized into four grains as follows: (1) the level of students' science ability is positively influenced by students' attitudes toward science and parents' educational background, (2) the science ability is negatively correlated with strategy based problem, phenomenon use illustrating topics, and lab investigation. But, the science capability is positively correlated with cooperative strategy and modeling, (3) the level of students' attitude toward science is positively influenced the jobs that students desired, the teaching and learning activities in the classroom, and parents' educational background, and (4) self-confidence and students' motivation to learn sciences are positively correlated with the science ability. The bigger self-confidence and students motivation to learn sciences, the bigger science ability students will reach.

The implications and suggestions that need to be followed up in this research are as follows: (1) this study shows that the teachers-oriented class activities have a positive effect on the achievement of science study. Then the teachers can make activities in an efficient way to improve their students' science achievement at class. This finding stressed the importance of teachers' training because the teachers still become the center or learning, (2) the important implications of this research is for the educational institution where science teachers learn. In Indonesia, teachers generally have the difficulty to carry out an effective learning process. Although the curriculum is designed for student-centered activities, it is still questionable in

the implementation of this method to improve their students' achievement. A system of science teacher training should be emphasizing science learning at class practically, not theoretically; (3) the result of this research shows that the confidence and motivation have an important impact on the science achievement. The findings emphasized the importance of the self-confidence and motivation in teaching science. Teachers should consider their self-confidence and motivation when they are teaching science in the class, (4) in the future, it needs to be examined more carefully about the influence of various kinds of science learning and teaching strategies toward science test scores accessed through standardized tests like a national exam. The poll is specifically designed in accordance with the certain teaching and learning strategy, not generally designed as in PISA 2006 poll, and (5) PISA 2006 data analysis should include the factors that relating to schools such as principals, teachers, facilities and infrastructure as variables affecting the students' ability of science. The analysis should use a method of Hierarchical Linear Model (HLM).

References

Gorman, M.E., Plucker, J.A., & Callahan, C.M. (1998). Turning students into inventors: Active learning modules for secondary students. Phi Delta Kappan, 79, 530-532.

Glynn, S.M., Taasoobshirazi, G., & Brickman, P. (2007). Non Science majors learning science: A theoretical model of motivation. Journal of Research in Science Teaching, 44(8), 1088-1107.

House, J.D. (2004). Cognitive-motivational characteristics and science achievement of adolescent students: result from the TIMSS 1995 and TIMSS 1999 assessment. International Journal of Instruction Media.

House, J.D. (2005). Classroom instruction and science achievement in Japan, Hongkong, and Chinese Taipe: result from the TIMSS 1999 assessment. International Journal of Instruction Media.

Johnson, S.K., & Stewart, J. (2002). Revising and assessing explanatory models in a high school genetetic class: A comparison of unsuccessful and successful performance. Science Education, 86, 463-480.

Leung, F. K. (2002). Behind the High Achievement of East Asian Students. Educational Research and Evaluation, 8, 87-108.

Martin, M.O., Mullis, I.V.S., & Foy, P. (with Olson, J.F., Erberber, E., Preuschoff, C., & Galia, J.). (2008). Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

OECD. (2007). PISA 2006 Science Competencies for Tomorrow's World: Volume 1 – Analysis. Paris: OECD.

Patrick, A.O., Kpangban, E., & Chibueeze, O.O. (2007). Motivation effects on test scores of senior secondary school science students. Study Home Community Science, 1(1), 57-64.

Papanastasiou, E. C. & Zembylas, M. (2004). Differential effects of science attitudes and science achievement in Australia, Cyprus, and the USA. International Journal of Science education, 26(3), 259-280.

Thomson, S. & De Bortoli, L. (2008). Exploring science literacy: how Australia measures up the PISA 2006 survey of students' science , reading and mathematical literacy skills. Camberwell, Vic.: ACER Press.

Scottish Journal of Arts, Social Sciences and Scientific Studies - ISSN 2047-1278
http://scottishjournal.co.uk

Evaluation of Child -Weaning Methods and Health Practices used Among Married Women in Kaduna North Local GovernmentArea of Kaduna State, Nigeria

Kajang, Yakubu Gorah PhD
Department Physical and Health Education;
Faculty of Education,
University of Jos, Plateau State, Nigeria
Email: ygkajang@gmail.com

Abstract

The study was on evaluation of child-weaning methods and health practices used among married women in Kaduna North Local Government Area of Kaduna state, Nigeria. The survey research design was used, questionnaire was the instrument used for the study. The sample consisted of 245 volunteered married women attending post- natal care with their children using available health facilities in the local government area. Frequencies and percentages were used in analyzing the data collected from the study which were used in answering the research questions stated. The chi- square was used in verifying the only hypothesis posed. The finding o f the study revealed among others that, gradual weaning 228 (93.06%), baby-led weaning 227 (92.65%) and planned weaning 146(59.59%) were the child weaning methods used by over 50% of the respondents. Changing clothes anytime the baby is bath, 240 (97.55%), washing clothes when dirty 235 (97.55%) and using feeding clothes when feeding the baby, 236 (96.32%) were the most common health practices used by weaning mothers. When an items analysis of the health practices used by the respondents' base on location using chi-square was done, it was discovered that none of the items was significant at. 05 level of significance. Provision of portable drinking water, 235 (95.91%), the health of the mother, 233 (95.10%) and provision of highly nutritive food, 232 (94.69%) were the most common factors facilitating child weaning among mothers. Malnutrition, 215 (87.75%), not being able to eat enough, 210(85.71%) were the common health problems associated with child weaning by the respondents. Base on the results, the following recommendations were made among others: Government can intensity awareness campaign programmes among expectant and nursing mothers at the health facility and community levels on the benefits of exclusive breast- feeding for six months and the dangers of early introduction of weaning foods. Since health problems develop a result of in- proper child weaning, it is recommended that physicians can take time to advise mothers to introduce iron- fortified foods inform of meat, fish or iron-fortified cereals at first to avoid iron deficiency.

Introduction

Breast feeding has been in existence since reproduction started with humans and is universally practiced. This will normally end with weaning when the child is old enough. In wean a child well, it goes with water, energy nutritional food to avoid early break down in the health of the child.

The term "weaning" comes from an Anglo-saxon word "wenian" meaning to become accustomed to something different (leaving breast feeding taking other food substance). Weaning from the breast is a natural, inevitable stage in a child's development. Through it could be a complex process involving nutritional, immunological biochemical and psychological adjustment (Lawrence and Lawrence, 1994:345). Added to this, they explained that weaning may mean the complete cessation of breast feeding (an abrupt or final wean) or it could be a gradual process of introducing complementary foods to the infant's diet while continuing to breast feed.

Discussing about breast feeding, sugarman and Kendall- tachett (1995) posited that infants were breastfed longer in ancient times than in western societies today. They stressed that breast feeding could continue from 12 to 18 months, or when menses restarted in the nursing mother. Furthermore, that mo in zulu societies had traditionally breast fed their infants until 18 moths at which point a new pregnancy would be anticipated. They went further to confirm that Anthropological studies emphasized that final weaning was done when the infant reaches four times his birth weight, when the infant age is six times the length of gestation (that is 4.5years), or when the first molar erupts.

As pointed out by Cosminsky (1993), weaning should begin at around 9 to 12 months of age or when the canine teeth appeared at that early weaning can lead to diarrhea leading to infant mortality. He stated that in the 1920s, the United state government publish infant care referred to as 'good book' and read by women from all socio-economic groups; which recommended cod liver oil, orange juice and artificial feeding

As research advanced, Public Health Agency (2008) in Canada did a study relevant to the present one and discovered that 87% of the children were breastfed for some period of time, while only 16.4% used exclusive breast feeding for six months. Gibson and Sanderson (2001) conducted a study in Uganda and discovered that diet assessment was done using conventional methods. While breast feeding was universal at birth, early weaning watery, energy and nutrient- poor staple food was wide spread in rural areas. The negative weaning practice of introducing complementary foods too early was highly prevented with almost half of the children (44.1%) having started complementary feeding before the age of 4 months. Again, over half of the children (62.1%) commenced the weaning process with cow milk. David and David (2005) did a similar study in Akure community, Ondo state and discovered that among the children, 58.3% had normal weight, 41.1% had middle weight, 23.1% used exclusive breast feeding, 9.5% received breast milk and traditional medicinal herbs 15.6% receive breast milk and commercial weaning food, 7.4% received commercial weaning food only, 24.11% received local weaning food and plus breast milk and 5.8% received the family diet. Some of these items are tested in the present study. In a related study, Oyibo and Okperi (2010) from Delta state found out that most of the nursing mothers 52.7% introduced complementary weaning food to their children from 4 to 6 months of life, while 26.3% and 2.0% of them introduce complementary food from 1 to 3 months and 6 months of life respectively. Over three-quarter (76.0%) of the respondents used home prepared weaning foods while 9% and 15.0% them had preference for commercial prepared weaning foods respectively for their children good health.

Health is defined by World Health Organization (WHO) (1964) as a state of complete physical, mental and social-wellbeing of an individual and not merely the absence of disease or infirmity. In another way, Uche (1991) described it as a feeling of wellbeing enjoyed by a person when his body systems work efficiently together and in harmony with the environment. This may largely dependent on how the individual practice good health.

Describing practice, Gadsby (2000) expressed that it is a regular activity an individual engages in other to improve a particular skill. Therefore, health practice is used in this work to mean those health related activities that an individual does on a daily bases that will help him/her to have a feeling of wellbeing enjoyed by married nursing mothers after weaning a child. Again, only those adult female individuals that have become male individual wives that were evaluated for the present study.

Evaluation as described by Enyi (2006) involves judging the merit or worth of one of more experiences: ideas or changes or appraisal. It is the qualitative judgment that is based on the quantitative data obtained on test and measurement. Evaluation ascertain the worth of a performance In terms of set objectives which was the case with the present study on evaluation of child weaning methods and health practices used among married women in Kaduna North area of Kaduna state.

Statement of the Problem

For years, observation seems to suggest that when a woman weans a child, she looks healthier, stronger and beautiful especially when she is eating well. In addition, it frees her from the stress of nursing and therefore has time for other domestic duties in the house. However, Onofiok and Nanyelugo (undated) explained that the weaning process may be gradual, lasting for months until the infant is finally introduced to the family diet. In the same vein, they expressed that it is possible to use abrupt weaning by introducing the infant straight into the family menu. This latter option as pointed out by them creates problems as the child may not be able to eat enough of the adult diet to meet his/her nutritional needs and that in west African countries, weaning can be a period of problems and vulnerability for the survival of the child.

Discussing about weaning problems in West Africa countries, Gibson and Sanderson (2001) posited that traditional weaning foods are known to be of low nutritional value and characterized by low protein, low energy density and high bulk maize pap or koko that can implicate the etiology of protein-energy malnutrition. In addition, that cereals form primary bases for most of the traditional weaning foods in the region (of which the study area is part). The protein content of maize and guinea corn as highlighted by them is of a poor quality, low in lysine and tryptophan. These two amino-acids are indispensable to the growth of the young child. It is possible therefore that the same conditions exist among child weaning mothers in the area of the study. This necessitated the present study on the Evaluation of child-weaning methods and Health practices used among married women in Kaduna North Local Government Area of Kaduna state.

To give direction to the study, the following research questions and hypothesis were raised.

1. What are the child- weaning methods used among married women on Kaduna North local Government area?
2. What is the age of child- weaning among married women in Kaduna North local Government Area?

3. What are the weaning methods used among married women in Kaduna North local Government Area?
4. What are the types of food used for child weaning among married women in Kaduna North local Government Area?
5. What are health practices used for child weaning among married women in Kaduna local Government Area?
6. What are the health problems associated with child weaning among married women in Kaduna North local Government Area?

A single hypothesis was tested at 05 level of significance that states thus:

Location has no significant difference on the health practices of married women used in child weaning in Kaduna North local Government Area.

Methods

The study was carried out using the survey design. The sample of the study was drawn from married women that attend post natal care in the various health facilities of the local Government Area. Only those who volunteered were used for the study which consisted of 245 respondents. A structured questionnaire form was utilized in collecting the data for the study. The instrument was divided in different sections, A, B, C, D, E, F and G. section A of the instrument was used to elicit general information of each √√respondent.

Section B elicited information on the child weaning methods used, section C raised items on the health practices for child weaning. Again, section E provided items on factors associated with child weaning, section F raised items on problem associated with child weaning and section G raised items on types of food used among the married women for child weaning. The reliability of the instrument was determined by the use of the split- half methods using the spearman rank order correlation co-efficient, a reliability coefficient index of. 68 was obtained.

The investigator and three trained assistants visited each of the health centres at least thrice for the purpose of collecting the data. The respondents were only required to tick (√) either 'yes' or 'No' options for all the items provided in the instrument. The data collected were tallied and put into frequency distribution for answering the research questions. Chi-square was used for further analysis of the data and the result used for verifying the only hypothesis stated.

Results

Table1- child weaning methods used among married women in Kaduna North N=245

Items	Responses			
	yes		No	
	f	%	f	%
Planned weaning	146	59.59	49	20
Baby- led weaning	227	92.65	18	7.34
Graded weaning	228	93.06	17	6.93
Doris offer nor refuse	111	45.30	134	54.69
Nature weaning	112	45.71	133	54.28

The results in Table1 above show that gradual weaning, 228(93.06%), baby-led weaning, 227 (92.65%) and planned weaning 146 (59.59%) were the weaning methods mostly used among the married women. However, the table shows that don't offer nor refuse and natural weaning methods were less used by the married women as indicated by 134 (54.69%) and 133 (54.28%) response

Table 2 Age of child-weaning among the married women in Kaduna North

N=245

Item	Responses			
	Yes		No	
	f	%	f	%
6months	46	18.79	149	60.81
1 year	71	28.97	174	71.02
1 year 6 months	121	49.38	124	50.61
2 years	34	13.87	211	86.12
Child stopping on its own	54	21.63	192	78.36

The results in Table 2 show that 1 year and 6months and a year were the ages mostly used by the women in weaning their children. However, the table also show that 2 years and child stopping on his/ her own were never used by the mothers for weaning their children as indicated by 211(85.12%) and 192 (78.36%) responses respectively.

Table 3 health practices used by married women for child weaning

N=245

Items	responses			
	Yes		No	
	F	%	f	%
Washing of hands clean water and soap	235	95.91	10	4.08
Using clean and builed utensils	235	95.91	10	4.08
Boiling of eating utensil after used	224	91.43	11	8.57
Chewing food before giving the baby	158	64.48	87	35.91
Washing baby's clothes when wet or dirty	239	97.55	6	2.44
Bathing twice / thrice a day	234	95.51	11	4.48
Changing bay's clothes after bathing	240	97.95	5	2.04
Using feeding cloth for feeding the baby	236	96.32	9	3.67
Spraying of room to prevent flied	236	96.32	9	3.67

The results in Table 3 show that changing baby's clothes after bath 240 (97.95%) washing the clothes when wet or dirty 239(97.55%), using feeding clothes to feed 236(

96.32%) spraying the room to prevent flies 226 (96.32%) and washing of hands with clean water and soap, 235 (95.91%) were the health practices used among weaning mothers. Other were, using cleaned and boiled utensils 235 (95.91%) bathing twice / thrice a day 234(95.51%) boiling of eating utensils after use 224 (91.42%) and chewing food before giving the baby 158 (64.48%).

Table 4 factors facilitating Good child weaning among married women

N= 245

Items	Responses			
	Yes		NO	
	f	%	f	%
Provision of portable drinking water	235	95.01	10	4.08
Provision of paper sewage disposal	224	91.42	21	8.57
Provision of highly nutritive food	232	94.69	13	5.30
Level of academic knowledge of mother	226	92.24	19	7.75
Naturally stopping breastfeeding	210	85.71	35	14.28
Occupation of mother	222	90.61	23	9.38
The health states of the mother	223	95.10	12	4.89
Economic status of the family	217	88.57	28	11.42

The results in Table 4 above show that provision of portable drinking water, 235 (95.91%), the health of the mother, 233 (95.10), provision of highly nutritive food 232 (94.69%), level of academic knowledge of mother, 226(92.24%) and provision of proper sewage disposal, 224 (91.42%) were the factors facilitating good child waning among married women in Kaduna North. Others were the occupation of mother 222(90.61%) economic status breast feeding 210 (85.71%).

Table 5- health problems associated with child weaning.

N=245

Items	Responses			
	Yes		No	
	F	%	f	%
Not being able to eat enough	210	85.71	35	14.28
Malnutrition	215	87.75	29	11.83
Poor motor and mental development	205	83.67	40	16.32
Lack of vitamin A and Iron deficiency	220	89.79	25	10.20
Kwashiorkor	190	77.55	55	22.45
Stunted growth	159	64.89	86	35.10

The results in Table 5 revealed that lack of vitamin A and Iron deficiency, 220 (89.79%), malnutrition, 215 (87.75%), not being able to eat enough, 210 (85.71%) and poor motor and mental development, 205 (83.67%) were the health problems associated with child weaning among married women in Kaduna North.

Table 6: types of find used for child weaning

N =245

Items	Responses			
	Yes		No	
	F	%	f	%
Cow milk	157	64.08	88	5.91
Akamu/ pap	241	98.36	4	1.63
Rice	206	84.08	39	15.91
Beans	219	89.38	26	10.61
Liver	237	96.73	8	3.26
Eggs	244	99.59	1	0.40
Fish	244	99.59	1	0.40
Meat	217	88.57	28	11.42
Fruits	237	96.73	8	3.26
Yam	180	73.46	65	26.53
Potatoes	214	87.34	31	12.65
Tuwo	215	87.75	30	12.35

The data in Table 6 revealed that eggs 244(99.59%), liver 244(99.59%), pap 241(98.36%), fruits 237 (96.73%), fish 224 (99.59%), beans 219 (89.38%) and meat 217 (88.57%), were the food used for child weaning by the respondents, others are, tuwo 215 (87.75%) potatoes 214 (87.34%), rice 206 (84.08%), yam 180 (73.46%) and cow milk 157 (64.08%)

Table 7: summary of chi- square value verifying the different in health practices used by married women for weaning children base on location.

Items	cal $\bar{x}$ value	table $\bar{x}$ value	level of sig.	df	Decision
Washing hands with soap	2.85	9.488	.05	4	accepted
Using cleaned and boiled utensils	4.03	9.488	.05	4	accepted
Chewing food before giving baby	2.87	9.488	.05	4	accepted
Washing baby's clothes	2.23	9.488	.05	4	accepted
Bathing twice/ thrice a day	4.46	9.488	.05	4	accepted
Changing baby's clothes	4.21	9.488	.05	4	accepted
Using feeding clothes for baby	3.54	9.488	.05	4	accepted
Spraying of room to prevent flies	3.79	9.488	.05	4	accepted

Discussion

The results in Table 1 show that gradual weaning 228 (93.06%), baby-led weaning 227 (92.65%) and planned weaning 1446 (59.59%) were the weaning methods mostly used by majority of the respondents. The results were expected due to the fact that at this stage of the child's development, the baby could be given food to eat on its own without necessarily being spoon-fed. The foods offered to the baby at this stage are soft-cooked and mashed into small easily manageable sizes where the individual may choose to use large chunk of apple that may easily be eaten by the baby. The results are in line with what Brown (1998) pointed out, that if a mother wants to wean her baby before its ready to be weaned on its own, a planned, gradual weaning is a much better choice than other weaning methods. He maintained that baby-led weaning is suitable for most infants and reduces maternal anxiety about weaning and feeding.

The results in Table 2 show that all the items were used by the respondents at various levels as indicated by them as follows: year 6 months 12 (49.38%), 1 year 71 (28.97%), child stooping on its own 53 (2.63%), 6 months 6 (18.77%) and 2 years 34 (13.87%) were the common ages used for weaning children among married women in the area. This result was quite expected as majority of the respondents do not use all these methods as shown by higher responses than the ones recorded above. This result seems to signify that the part of this instrument was not quite understood by majority of the respondents. On the other hand, the results were so because individual babies grow at different range in that they do not grow at the same rate. Again, the socio-economic status of families differ which might have been a major factor affecting the feeding of nursing mothers.

The results in Table 3 indicated that changing clothes anytime the baby is bathed 240 (97.95%), washing the clothes when wet/dirty 239 (97.55%), using feeding clothes when feeding the baby 236 (96.32%), spraying the room to prevent flies 236 (96.32%) and washing of hands with clean water and soap 235 (95.91%) were the health practices used by nursing weaning mothers. Others were, using cleaned and boiled utensils, bathing twice/thrice a day, boiling eating utensils and chewing the food in the mouth before giving the baby as indicated by 235 (95.91%), 234 (95.51%), 224 (91.42%) and 158 (64.48%) responses respectively.

The results were expected because mothers and individuals generally are aware of the importance of good health practices. More so that they are being taught during antenatal on the need for their proper well being and that of their children. The result is in line with what Garg (2000) stressed, that hygienic practices was found among 100% mothers by washing hands with soap and water, as well as using cleaned and boiled utensils exclusively meant for the child.

The results in Table 4 indicated that provision of potable drinking water 235 (95.91%), the health of the mother 233 (95.10%), provision of highly nutritive food 232 (94.69%), level of academic knowledge of the mother 226 (92.24%), provision of proper sewage disposure 224 (91.42%), occupation of the mother 222(90.61%), economic status of the family 217 (88.57%) and the child natural stopping breast feeding 210 (85.71%) where the factor facilitating the weaning of children among married women. The result was expected because government and individuals provide water and proper sewage facilities on the use of good drinking water and sewage facilities during their post natal visitation to the clinics and hospitals in the area. The result agrees with what Babatunde (2000) suggested that government should intensify their effort to provide pipe-borne water and proper sewage disposal as they will reduce the indences of food contamination and infectious diseases in the country.

The results in Table 5 showed that lack of vitamin A and Iron deficiency 220 (89.79%), malnutrition 215 (87.75%), not being able to eat enough 210 (85.71%), poor motor and mental

development 205 (83.67%) kwashiorkor 190 (77.55%) and stunted growth 159 (64.89%) were the common health problems with child weaning among married women. This result is not a surprise because lack of proper breast feeding or early introduction of complementary food can lead to diarrhea, malnutrition etc and all these are common among infants. The results support what Armar (1991) posited that the problems inherent in the traditional West African weaning foods and feeding practices predispose the infant to malnutrition, growth retardation, infection and high mortality. He further stressed that malnutrition is a common problem among infants and children in the poor socio-economic groups of developing countries and that 80% suffer from kwashiorkor, marasmus and stunted growth.

The results in Table 6 reveal that eggs 244(99.59%), pap 2441 (98.36%), liver 237 (96.73%) fruits 237 (96.73%) fish 244 (91.59%), beans 219 (89.38%), meat 217 (87.75%), Tuwo 215 (87.75%), potatoes 214 (87.34%), rice 206 (84.08%), yam 180 (73.46%) and cow milk 157 (64.08%) were the common foods used among married women for weaning children. The result was not surprising due to the fact that these categories of food items are common in the area of the study. The result is in line with what Hoetanen (2001) identified, over 60 (66.3%) children consume cow milk as their usual diet, 89.1% of the children were given maize porridge as their usual diet, 96.6% consumed cooked banana and 88.9% of the children consumed food like beans potatoes, fish, meat, liver, cassava etc.

References

Armar, E.B. (1991). Parental influence on children diet**.** ***Proceeding of the nutrition society, 54, 747-758***

Babatunde, G.O. (2000) .Protein quality of some Nigeria food stuff. ***Chemical assay of nutrition and amino acid composition society, 26, 1-15.***

Brown, K.H. (2001). Effects of age of introduction of complementary foods on infant breast milk intake. **.** ***Journal of Total Energy intake and growth 5(3) , 225-263***

Cosminsky.S. (1993). Child feeding practices and rural area of Zimbabwe. ***Journal of science and medicine,10(4), 142-146***.

David, C.B and David, P.H. (2005). Bottle feeding and malnutrition: the bottle starved baby***. Journal of Tropical pendiatrics, 2(5), 31-36***

Enyi. F.O. (2006). Nutrition awareness, health practices and dietary supplementation. Human Nutrition: ***Applies Nutrition, 42, 112-118***

Garg, F.G. (2000). Nutritional knowledge, beliefs and behaviours in young mothers**.** ***International journal of Epidemiology, 3(3), 70-74***

Gadsby, A. (2000). ***Long man contemporary dictionary English. Newyork: Macmillian publishers.***

Gibson, E. & sanderson, D. (2001). Factor analysis structure of food preferences in four year old children in the UK. ***Health Education Quaterly, 20, 563.***

Hoetamen, B.D. (2001) mothers, children and dieting: investigating the transmission of weight control***. British journal of children psychology, 42, 4-10.***

Lawrence, R.A & Lawrence, R.M. (1994). ***Breast feeding: a guide for the medical profession, (5thed.). St Louis: the c.v. Mosby company.***

Onofiok, N. & Nanyelogo, D.O. (undated). Nutrient intake of infants of high and low socio-economic group in Nsuuka, Nigeria. Paper present at department of home science and Nutrition, University of Nigeria.

Oyibo, F.O. & Okperi D.E. (2010). Food consumption practices of households in Benin city. Implication for the Nutritionist. ***Journal of Home Economics Reseach, 8(2), 12-16.***

Public Health Agency (2008). Food behavior of canaclian children: Food and Nutrition. ***An international journal, 14(2), 46-49***.

Sugarman, M. & Kendall-Tackelt, K.A. (1995). Weaning ages in a sample of American women who practice extended breast-feeding. ***Clinical pediatrics, 5(3), 14-18.***

Uche, R.s. (1991***). Nutrition London*** :The Macmillian press lmited.

WHO (1964) WHO collaborative study them on the role of breast feeding on the prevention of infant mortality. Effect of breast feeding on infant and child mortality due to infectious diseases in less developed countries, a posted analysis.

Scottish Journal of Arts, Social Sciences and Scientific Studies - ISSN 2047-1278
http://scottishjournal.co.uk

The Needs of Higher Education in Algeria with a View to Improving the Quality

Imene Fourar
PhD Student, National Higher School of Management, Algeria
ifourar@gmail.com

Zakia Megri
Conference Professor "A", Faculty of Economic, Commercial and Management Sciences, Batna University, Algeria
megrizakia@yahoo.fr

Abstract:
One of the strong impacts of globalization as a universal process in this new millennium is to bring and impose change to many countries. In this line of thought, Algeria as the rest of the globe has struggled to keep in touch with recent world changes via reforming not only its political, economic and commercial policies but goes beyond to reach the system of education and it could be clearly seen at the tertiary level where almost all institutions have adopted the new educational system mainly the "LMD" as the new-fangled policy for a change. Within the past previous years, Algeria has relatively made some progress in the field of Education through the continuous efforts to promote this sector, in order to make its system capable of performing and accomplishing the tasks assigned to it. In this regard, this study aims to examine the status quo of the Algerian Higher Education quality and reform approaches, in addition to exploring The Needs of Higher Education in Algeria with a view to the improvement of quality.

Keywords: Higher Education- Algeria- LMD system- Quality- Quality Assurance

Introduction:

Algerian Higher education is going through a period of significant transition imposed by modern developments, which set its institutions under a continuous pressure facing constant challenges to adapt and to lead the huge responsibilities of investing in the minds and providing communities with the intellectual capital that promote their development and achieve excellence and advancement. In this line of thought, we find that many higher education institutions in different countries have reached advanced stages in achieving effective and successful applications of quality in education; which led the higher education institutions in other states -Notably Algeria- to seek following and adapting their experience and expertise in order to improve the quality of higher education, in light of the most important contemporary trends in the field of organizational development. Based on the above, the question that pops up in this context is:

- What are The Needs of Higher Education in Algeria with a view to the improvement of quality?

  In addition to some other sub-questions, namely:
- What are the trends and challenges experienced by higher education, globally and locally?
- What are the different dimensions of Quality in Higher Education?
- What are the Quality approaches adopted within the Algerian Higher Education?

1. Basics about Higher Education:

The future of nations is basically shaped between the walls of higher education institutions, these institutions that take charge of many tasks, play roles of increasing complexity and face different challenges to adapt to a universal and globalized educational system in constant growth and change.

1.1. An Overview about Higher Education:

1.1.1. Higher Education: Concepts and Missions:

Higher education includes ‘all types of studies, training or training for research at the post-secondary level, provided by universities or other educational establishments that are approved as institutions of higher education by the competent State authorities’.

Higher education has given ample proof of its viability over the centuries and of its ability to change and to induce change and progress in society. Owing to the scope and pace of change, society has become increasingly knowledge-based so that higher learning and research now act as essential components of cultural, socio-economic and environmentally sustainable development of individuals, communities and nations.

Concerning the missions of higher education, many terms can be used to refer to that, such as: functions, purposes, roles or responsibilities. And despite the differences in the details of higher education systems from one country to another due to differences in the nature of the communities at various levels on one hand and the needs and priorities of those communities on the other hand, However, the functions of higher education in general do not depart from the axes specified within the report of the World Conference of UNESCO on higher education for the twenty first century: vision and action, These missions can be summarized as follows (http://www.unesco.org/education):

- Educating, training and undertaking research to meet the needs of all sectors of human activity, by offering relevant qualifications, and to contribute to the sustainable development and improvement of society as a whole.
- Fulfilling the ethical tasks, autonomy, responsibility and the anticipatory function, in addition to helping identify and address issues that affect the well-being of communities and global society.

Keeping in mind that higher education system should enhance the capacity to live with uncertainty, originality, and to provide a basic prerequisite for attaining and sustaining an indispensable level of quality; and should place students at the centre of their concerns, within a lifelong perspective.

1.1.2. Challenges and Issues facing Higher Education:

Higher education is faced with great challenges and difficulties related to financing, equity of conditions at access into and during the course of studies, improved staff development, skills-based training, enhancement and preservation of quality in teaching, research and services, relevance of programs, employability of graduates, establishment of efficient co-operation agreements and equitable access to the benefits of international co-operation (http://unesdoc.unesco.org/).

At the same time, higher education is being challenged by new opportunities relating to technologies that are improving the ways in which knowledge can be produced, managed, disseminated, accessed and controlled.

Most of the challenges are caused by the emergence and development of some universal modern phenomena of: Globalization, Regionalization, Internationalization, Democratization Technologization, Offshoring, Marginalization and Polarization.

1.2. Facts about the Algerian Higher Education:

Within the past previous years, Algeria has relatively made some progress in the field of Education through the continuous efforts to promote this sector, in order to make its system capable of performing and accomplishing the tasks assigned to it. In this regard, we present the important historical developments that the Algerian Higher Education has witnessed; describe the main features of its system as well as its main imbalances and issues.

1.2.1. Historical developments of the Algerian Higher Education:

Higher Education in Algeria has witnessed several developments over the past decades that followed the independence, in light of the economic, social and political changes within the Algerian Society. These main developments can be presented through the following stages:

- First Phase From 1962 to 1969:

After there has been only one university in Algeria, which was the University of Algiers which was established in 1908, 2 other universities opened their doors: university of Oran (1966) and the university of Constantine (1967).The Pedagogical organization was identical to the French system, with several inherited distortions, and an awareness of the need for urgent reform. Higher Education was at that time was attached to the ministry of national Education.

- Second Phase From 1970 to 1998:

this phase started by the establishment date of the Ministry of Higher Education and Scientific Research, a year after a reform document was released as a chart that identifies the strategy for the future of Higher Education in Algeria, this reform focused on 4 main goals:

diversification and intensification of college majors and fields covering about 105 branches, Increasing the number of universities geographically distributed on the country, The Algerianization of the teaching staff and working on improving the scientific level, besides replacing French with Arabic as a national language. Many academic institutions were built in different cities in order to meet the growing demand for higher education. A general map was prepared in 1994 to plan university education until the year of 2000 based on the national economy needs in accordance to its different factors (Talha, 2012).

- Third Phase From 1998:

this phase is characterized by : the guiding law for Higher Education that was approved by the government council in September 1998, reorganizing the university in the form of faculties, creating 13 university centers and converting 19 centers into universities and more importantly, the overall reform of the Algerian Higher Education through adopting the system: LMD (License – Master – Doctorat) by the beginning of the season: 2004/2005, the new system was gradually generalized on the universities across the country (Meradci, 2010).

1.2.2. General features of the Algerian Higher Education:

On the legal terms, the 1996 Constitution states in Article 53 that the state is the one organizing and regulating the educational system, and confirms that to every Algerian: the right to free education is guaranteed, in light of the conditions specified by law, when the general service of higher education lies under the authority of the Minister of Higher Education.

Concerning the types of higher education institutions, we distinguish: institutions of a scientific, cultural and professional nature, under the auspices of the Ministry of Higher Education and Scientific Research consisting of: universities, academic centers, higher schools for teachers and national higher schools, in addition to other public institutions dependent to other ministries, but the Ministry of Higher Education and Scientific Research remains responsible for its educational supervision. The Algerian national network covers 91 institutions, including: 47 universities, 10 university centers, 19 Higher School and professional institutes, 10 preparatory schools with preparatory built in classes (Daho and Baghdad, 2012).

The number of students for the year 2012 reached 1.300.000, including 59% female and 41% male, and the number of graduates in Algeria from 1962 until 2012 is estimated 2.000.000 (https://www.mesrs.dz/).

In the field of scientific research, the law issued on 4 April 1999, as amended and supplemented by Law 23 February 2008 state that scientific research and technological development are devoted as national priorities.With more than 1000 laboratories, 11centers and 28.000 researchers in 2013.

2. The Notion of Quality in Higher Education:

Higher education is going through significant shifts during the recent few decades, as a result of the changes and developments forcing it to adapt, grow and implement some improvements in the quality of teaching and learning. With what it takes to raise the level of academic performance in various aspects, which is something that can’t be achieved without a good understanding and proper application of the philosophy of quality in this field.

2.1. The Conceptual Framework of Quality:

2.1.1. The Concept of Quality and its development:

ISO 9000's definition of quality is "degree to which a set of inherent characteristics fulfils requirement" when the towering intellect and leading personality of the quality revolution Edward Deming has stated that: the customer's definition to quality is the only one that truly matters (Hamilton, 2009). The concept of quality appeared first in the economic sphere on the basis of industrial and technological competition between firms, In order for them to gain the trust of the market and the customers. It was historically developed from examination and control, then quality assurance, leading to total quality management (Flissi, 2012). Table (1) gives the chronology of quality movement.

Table (1): The Chronology of Quality Movement.

Pre-1900	Quality as an integral element of craftsmanship
1900-1920	Quality control by foreman
1920-1940	Inspection-based quality control
1940-1960	Statistical process control
1960-1980	Quality assurance/total quality control (the quality department)
1980-1990	Total quality management
1990-Present	TQM, the culture of continuous improvement, organization-wide quality management

Source: Sallis (1996)

2.1.2. Transferring the notion of quality from Industry to Education:

After the success of adopting the philosophy of quality in the industry, with the great results that brought the economy of many countries to the top of the Global Competitiveness, Educational policy-makers decided to take advantage of the quality management in order to save Education from the crisis caused by the increasing pressure from the continuous change of knowledge and the requirements of the labor market. But this transfer of the quality notion from industry to education caused huge controversy about the nature of the mechanisms of application. The people of Education realize that what is good for the industry does not necessarily fit for education, as the behaviors of students and teachers can't be profiled like the case for raw materials and manufactured products. This was stated in the UNESCO report released in 2005 on "Education for All in order to ensure quality" indicating that the approach based on the productive function largely ignores the methods by which the process of learning and teaching are pursued, besides the creative interaction that occurs in the classroom and its impact on the quality of education. Therefore, people interested in the educational reform made sure to benefit from the quality management applied in industry through compatibility with the principles of this philosophy and not identically dealing with it, in other words by adapting the philosophy of quality management to the education system and not transferring it as it is. Recent years have witnessed a change in the language of educational reform with the emergence of new terms such as: total quality management in education, quality assurance and accreditation, these terms have become part of the language of higher education system, with the transformation from the culture of quantity to the culture of quality, and from the education of memorizing to the education of innovating (Ben Abdelkarim, 2007).

2.2. Dimensions of Quality in Higher Education:

Defining the concept of quality in higher education is a big challenge itself, for it's difficult to formulate and choose one specific definition or deal with it from one angle, the outlook must be inclusive and should meet the requirements and expectations of the public related to students, faculty members, employers and society as a whole. In this context, the research literature in the field of quality in higher education indicated that it can be defined from several angles as follows:

Quality in the sense of excellence - Quality in the sense of assuring and securing minimum standards - Quality in the sense of alignment with the goals – Quality in the sense of satisfying the beneficiaries and stakeholders (Ragad & Laakikza, 2012).

Owlia and Aspinwall (1996) based on review of service quality dimensions; present a comprehensive list with their interpretations for Higher Education in Table (2)

Table (2): Service Quality Dimensions in Higher Education

Dimensions	Definition in higher education
Reliability	The degree to which education is correct, accurate and up to date. How well an institution keeps its promises? The degree of consistency in educational process.
Responsiveness	Willingness and readiness of staff to help students
Understanding customers	Understanding students and their needs
Access	The extent to which staff are available for guidance and advice
Competence	The theoretical and practical knowledge of staff as well as other presentation skills
Courtesy	Emotive and positive attitude towards students
Communication	How well lecturers and students communicate in the classroom?
Credibility	The degree of trustworthiness of the institution
Security	Confidentiality of information
Tangible	State, sufficiency and availability of equipment and facilities
Performance	Primary knowledge/skills required for students
Completeness	Supplementary knowledge and skills, use of computer
Flexibility	The degree to which knowledge/skills learned is applicable to other fields.
Redress	How well an institution handles customers' complaints and solves problems?

Source: Owlia and Aspinwall (1996)

It should be noted that the most important axes or dimensions of the application of quality in higher education include (Nacer, 2013):

- Quality of the teaching staff: that requires a range of characteristics such as flexible thinking, understanding and communication skills, a desire and motivation to educate, continuous learning and the ability to self-criticism.
- Quality of the student: who's considered the main core of the educational process. The student must have the motivation to learn, the ability to interact and tackle, besides self construction.

- Quality of educational curriculum and teaching methods: Those have to be inclusive, renewed, flexible and adopted to the global challenges and the modern context.
- Quality of infrastructures and educational material: by making use of modern techniques and devices with the highest possible efficiency.
- Quality of educational administration, legislation and regulations: the latter should be clear, flexible and supportive to what serves the interests of Education.
- Quality of funding and spending.

There is a range of issues taken into account when dealing with quality in higher education institutions at the global level, for the philosophy of quality in this area is associated with a set of correlated concepts and terminology, namely:

- Accreditation:

The process by which a (non)-governmental or private body evaluates the quality of a higher education institution as a whole or of a specific educational programme in order to formally recognize it as having met certain pre-determined minimal criteria or standards. The result of this process is usually the awarding of a status (a yes/no decision), of recognition, and sometimes of a license to operate within a time-limited validity. The process can imply initial and periodic self-study and evaluation by external peers. The accreditation process generally involves three specific steps: (1) a self- evaluation process conducted by the faculty, the administrators, and the staff of the institution or academic programme, resulting in a report that takes as its reference the set of standards and criteria of the accrediting body; (2) a study visit, conducted by a team of peers, selected by the accrediting organization, which reviews the evidence, visits the premises, and interviews the academic and administrative staff, resulting in an assessment report, including a recommendation to the commission of the accrediting body; (3) an examination by the commission of the evidence and recommendation on the basis of the given set of criteria concerning quality and resulting in a final judgment and the communication of the formal decision to the institution and other constituencies, if appropriate (Vlaceanu et al., 2007).

- Quality Assurance:

Can be defined as the process of finding mechanisms and procedures that are applied in a timely manner to make sure that the desired quality will be reached as required, it is also known as the means to ensure that the academic standards -derived from the institution's mission- have been defined and pursued in accordance with the corresponding standards, whether nationally or internationally, And that the quality of learning opportunities, research and community participation is relevant and able to meet the expectations of the stakeholders (AbdelHadj et al., 2009).

According the European Association of Quality Assurance in Higher Education (EAQAHE), the concept of quality assurance in Higher Education demonstrates a set of administrative and evaluative procedures of a systematic nature, adopted by the institutions of higher education in order to monitor performance and ensure the achievement of quality outputs (Jamal et al., 2013).

Quality Assurance is the responsibility of everyone in an educational institution, though the top management sets the policies and priorities. Thus assuring quality should be a continuous and an ongoing process. It should not be considered as a onetime activity for accreditation alone. In spite of the importance of accreditation as external quality monitoring, and the credibility attached to it, developing an internal quality assurance mechanism in educational institutions is highly important. Therefore, understanding the criteria of quality

assurance and adhering to the best practices become highly significant. Across the world quality assurance is done in the following ways (Sanjya, 2007):

- Self Evaluation/ Self Study.
- Peer review by a panel of experts.
- Analysis of statistical information and/or use of performance indicators or the best practices benchmarking.
- Surveys of students, graduates, employers, professional bodies.
- Testing the knowledge, skills and competencies of the students.

3. Quality Approaches in the Algerian Higher Education:

The Educational System in any country is designed in a way that serves and responds to economic, social, cultural and even political purposes. These purposes vary according to the aspirations and priorities of each country, however, the one main ultimate goal remains reaching and attaining a comprehensive development. Within this framework, the Algerian Higher Education system has witnessed many changes and reforms with their ups and downs, reforms that, unfortunately couldn't manage to get results that reach the fixed expectations, and the battle remains between the increasing challenges and the misdirected efforts.

3.1. Adopting the LMD system: between barriers and aspirations

The Algerian university has gone through several reforms, according to the changing in socio-economical needs of the country as well as those of science and technology. The most important one is the 1971 which has structured higher education in Algeria and was intended mainly to arabize and algerianize all higher education.

This system worked for a good time but afterwards it has shown its limits. In a systemic approach, the "university "system requirements were no more satisfied with the "classic" approach and an improvement or change was necessary. It was noted, especially the following deficiencies:

• Educational programs no longer meet the new socio-economical data.

• Training mono disciplinary in classical approach where concept of general culture is completely absent.

• A significant failure rate due primarily to uncertainty about the future among students.

• Lack of motivation among teachers and students.

• Centralized management of the university.

Given all these problems, reactions were necessary. Thus, the Algerian government has decided, from 2001 to diagnose the situation in order to provide immediate and sustainable solutions for higher education. A new «university» system has imposed itself (Megnounf, 2009).

In light of the reforms applied on the Algerian universities in an attempt to adapt the university community and the educational system as a whole to the changing requirements concerning the aspect of quality in higher education. The Algerian decision makers seemed to call for urgent implementation of what's known as "The LMD System" by the Ministry of Higher Education and Scientific Research as an alternative to the classic system which was perceived as unable to respond to the modern developments within the various fields

The LMD system is an educational system inspired by the educational policies of the European countries, structured on 3 main stages, and organized around 3 exit levels:

- BAC+3: Licenses (L);
- BAC+5: Master's degrees (M);
- BAC+8: Doctorates (D).

All the studies are broken down into semesters with examinations (first and second session) held at the end of each semester. Each curriculum (Licence and Master's courses) and each module (UE) is worth a certain number of ECTS (European Credit Transfer Systems).

ECTS are credits that will allow assessing the whole study semester (lectures, tutorials, practical work, work placement, term paper, project, personal work etc).Each semester is worth 30 ECTS.

The License curriculum corresponds to a validation of 180 ECTS (6 semesters). The Master's degrees correspond to a validation of 120 ECTS (4 semesters).

The LMD reform was launched as a pilot scheme in the Algerian universities during the academic year 2003-2004. Three years after the implementation of the first cycle (Licence degree) and at the time of the implementation of the second cycle (Master degree). After the report submitted by the National Commission for the reform of the educational system in its plan to reform higher education, adopted by the Council of Ministers on 20 April 2002, regarding the preparation and development of an in-depth reform of higher education through a new structure attached to the renewal of all of the programs and pedagogical management (Djekoun, 2013).

The main objectives of the LMD system consist of (Zarzour, 2005):

- Improving the quality of university education taking into account meeting the social demand.
- Providing the adequacy between university education and the needs of the working world.
- The development of academic training vocationally by enhancing the interactions between the university and various economic institutions.
- Facilitating the mobility of students between the Algerian and international universities.
- Adapting and harmonizing the Algerian Higher Education system with the global context.
- The recognition of the Algerian diplomas on an international level.
- Encouraging the concept of governance within the Higher Education institutions.

With a critical reading and observation to the nature of this system (LMD), we find that despite the fact that it's aligned with the modern era and the globalized context, this system is clearly of a European nature, prepared and developed in accordance with the needs and data of occidental societies. When it has achieved the results expected from it among these societies, it's posing a growing problematic concerning its nonadjustment to the social and economic environment of the Algerian Universities, in addition to the existence of a huge gap between its theoretical content and the procedures of its application in reality, as stated by Mr. Bachir Mssitfa – Secretary of State to the Prime Minister charged of prospective and statistics – in his article titled: "The University Drowning in a drop called: LMD system", this system is an identical copy to the French system, and even if this copying was conducted in order to follow the steps of some successful experiences, it can't possibly work without applying some adjustments that take into consideration the nature and characteristics of the Algerian society (Mssitfa, 2013).

At the time where this system was supposed to meet the needs of the market, it's noticed that there is a remarkable lack of coordination between economic institutions and universities, adding to that the limitations of laws and legislations related to this matter, which

resulted in problems concerning accepting and approving the diplomas obtained through a course within the LMD system.

It is high time to stop and consider the strengths and weaknesses of this system in order to improve its effectiveness (Bouteldja, 2010).

So now after nearly a decade since launching this system, various parties are questioning it and wondering whether it can really lead the Algerian Higher Education towards raising and winning the challenge of quality.

3.2. Adopting Quality Assurance within the Algerian Higher Education:

A practical application of quality practices within Higher Education, require reconsidering: the mission, the main purposes and the strategies adopted by its institutions. Besides, reviewing the standards in the light of the general trend towards improvement of various dimensions and aspects of the teaching process.

The development of formal quality assurance systems has been one of the most significant trends to affect tertiary education systems during the past few decades (Fabrice & Alexander, 2013).

The term quality assurance in higher education is increasingly used to denote the practices whereby academic standards, i.e., the level of academic achievement attained by higher education graduates, are maintained and improved. This definition of academic quality as equivalent to academic standards is consistent with the emerging focus in higher education policies on student learning outcomes, the specific levels of knowledge, skills, and abilities that students achieve as a consequence of their engagement in a particular education program (David, 2007).

The establishment of a quality assurance system requires the establishment of an evaluation system. This evaluation can be internal or external. The internal assessment is named self-assessment. It can be applied to the institution either as programmatic evaluation as well as an institutional evaluation.

For monitoring quality in the Algerian universities, it is true that measures to improve the quality of performance in the Algerian universities exist, and that these aspects have been and are a permanent concern to all stakeholders of higher education (departments, faculties, universities, regional conferences and the ministry) (Boubakour, 2009).

In terms of assessment, instruments and evaluation bodies exist in both education and scientific research, such as: Tutoring, Scientific Committee of the department, Scientific council of the faculty, Scientific council of the university, administrative board of the institution, Regional conference of universities, National conference, various expert committees, national pedagogical committee, National Commission for the Evaluation of national research projects, National Agency for the Development of Academic Research, National Council for Scientific and Technical Research (Boubakour, 2009).

However, we can say that the Algerian Authorities realized the necessity and inevitability of the of quality assurance application in higher education, with some kind of delay… Not until June 2008, did the ministry of Higher Education organize an international conference on quality assurance, later a cell (task force) commissioned by the ministry to handle the project, initially supported by some international experts. In 31/05/2010, the **CIAQES** (***C****ommission d'****I****mplémentation de l'****A****ssurance* ***Q****ualité dans l'****E****nseignement* ***S****upérieur- Implementation Committee of Quality Assurance in Higher Education*) was established and launched, with several assigned tasks:

- The preparation of a national system of criteria and indicators (referential) to ensure quality, taking into account international standards.
- Determining the criteria for selecting typical institutions of higher education and the criteria for selecting those responsible for quality assurance in tertiary institutions.
- Preparing an informative program dedicated to the institutions and universities, in addition to a training program for those responsible for quality assurance at each institution.
- Ensuring the follow up of the implementation.

It should be noted that many activities were already undertaken in this context, such as adopting the internal quality assurance as a strategic choice through the self- assessment as a first stage in line with the continuous development of Education Quality, in addition to Completing the formation of the National Committee members through the training program that was followed by field visits to some European institutions (Berkan & Barouche, 2012).

This project of Quality Assurance Implementing within Algerian Higher Education institutions is without a doubt of a great importance, it's still a work in a progress and it should mainly be managed as an organizational Change process, with the expected resistance to change and the drifts that might and will probably go with it.

Conclusion:

Dealing with change has become inevitable for everyone, including Higher Education institutions involved parties, and dealing with this process is no longer an option, the choice only remains concerning the means or methods that can be used to cope with this change and to conquer the challenge of quality. This challenge that became the ultimate goal behind the different applied reforms. The case of Algeria in the pursuit of gaining the quality battle is still at its beginning, measure have to be taken to speed the process, investing, spreading awareness, building values and learning from the previous failures and mistakes , are all initiatives that must take place within the reform. It should also be noted that, evaluation is, widely, needed. To put it differently, providing a continuous evaluation which should be followed by a rigorous assessment may constitute a first stone in the process of establishing solid foundations for promoting the concept of quality among all the teaching and learning practices.

At the End, and during this journey, it should be kept in mind that: In the race for quality, there is no finish line!

References :

AbdelHadj, Faysal et al. (2009), Qualitative Standards and Quantitative Indicators of Quality Assurance and Accreditation of the Arab Universities Union Members, the Board of Quality Assurance and Accreditation of Arab Universities, Association of Arab Universities, Amman, pp. 9-10.

Abdellatif, Mami (2009), Managing Quality And Quality Assurance In The Lmd Era: The Algerian Case, International Technology, Education and Development Conference, Ferhat Abbas University.

Ben Abdelkarim, Ibrahim (2007), From a Traditional School to a Quality School : Obstacles transformation, fourteenth annual meeting Saudi Educational and Psychological: Quality in Higher Education.pp.4.

Berkan, Youcef & Barouch, Zinedine (2012), A Project of Implementing a Quality Assurance System within the Algerian Higher Education Institutions: Reality and Prospects, The Second International Arab Conference on Quality Assurance in Higher Education, pp. 812-813.

Boubakour, Fares (2009), L'assurance qualité au sein de l'université Algérienne: un secteur qui doit tirer l'économie et la société vers le haut, les débats de l'heur, Elwatan économie, pp. 8-9.

Bouteldja, Riche (2010), Teaching Study Skills and Research Skills in the LMD System: The Missing Link, Department of English, Mouloud Mammeri University, Tizi-Ouzou.

Daho, Allab & Baghdad, Benstaali (2012), Higher Education In Algeria, in the Tempus Study "Overview of the Higher Education Systems in the Tempus Partner Countries Southern Mediterranean" Education, Audiovisual and culture executive Agency, pp.17-18.

Djekoun, AbdelHamid, La réforme LMD en Algérie :État des lieux et perspective, l'Université Mentouri Constantine. http://www.umc.edu.dz/vf/index.php/systeme-lmd/lmd-en-algerie/34-voire-larticle-detaile- consulté le 05/05/2013

Fabrice, Hénard & Alexander, Meterle (2013), Governance and Quality Guidelines in Higher Education, OECD, p. 19.

Flissi, Linda (2012), The Reality of the Quality of Services in Organizations and their Role in Achieving Outstanding Performance: A Case Study Faculty of Economic and commercial Sciences, University M'hamed Bougherra Boumerdes, a dissertation submitted within the requirements of the Master's degree in economic sciences, specialty management of organizations.

Hamilton, Nana (2009), Améliorer la qualité des services : Avec la Gestion des Problèmes ITIL, Paris, Groupe Eyrolles, p. 248.

Jamal, Issam et al. (2013), A Suggested Framework to Ensure the Quality Management of Higher Education Institutions From the Perspective Of The Arab Strategic Planning, Third Arab International Conference to ensure the quality of higher education, Zaytoonah University, Jordan, p. 658.

Megnounf, Abdellatif (2009), The "LMD" System and the Algerian University: Five Years After, The case of the Faculty of Engineering, Tlemcen, p. 230.

Meradci, Hamza (2010), The Role of Quality of Higher Education in Promoting Economic Growth-Algeria-Case, Study Submission within the requirements of a master's degree in management science, faculty of Economics University of El Hadj Lakhdar, Batna.pp.73-74.

Mssitfa, Bachir (2013), The Algerian Univrsity Drowning in a Drop named LMD System, Echourouk Online http://www.echoroukonline.com/ara/articles/70138.html consulted on 17/04/2013.

Nacer, Mourad (2013), The role of TQM in Improving the Quality of Higher Education: the case of Algeria, Researches of the Third Arab International Conference to ensure the quality of higher education, the University of Zitouna, p. 539.

Owlia, M.S & Aspinwall, E.M (1996), A Framework for the Dimensions of Quality in Higher Education, Quality Assurance in Education, pp.12-20.

Ragad, Saliha & Laakikza, Yachin (2012), Quality Assurance in Higher Education Institutions: a suggested model to implement a system of quality assurance in higher education institutions of Algeria, the second international symposium on quality assurance in higher education: field trials and good performance indicators and prospects. pp. 23-24.

Sallis, E. (1996), Total Quality Management in Education, 2nd Edition, London, Kogan Page, pp.12-14.

Sanjya, Mishra (2007), Quality Assurance in Higher Education: An introduction, National assessment and accreditation council, Bangalour, India, pp.24-26.

Talha, Abdelkader (2012), An Attempt to Measure the Efficiency of Algerian University Using the Method of Data Analyze Study : the case of Saida University- A dissertation to obtain note by master's degree, University of Abu Bakr Belcaid Tlemcen, Faculty of Economic Sciences and management and business, specialty corporate governance.pp.75-77.

Vlaceanu, Làzar & Grunberg, Laura & Parlea, Dan (2007), Quality Assurance and Accreditation: A glossary of basic terms and definitions, first edition, Unesco, Bucharest, pp. 25,26

Zarzour, Ahmad (2006), Evaluation of the Application of the Reform of a New University "System Bachelor Master Doctorate" in light of the preparation of students

to the world of work: a field study at the University of Mentouri Constantine and the University Centre in Um El Bawaki, a dissertation submitted to the master's degree in Organizational Psychology and Human Resource Development, Department of Psychology and Science Education, University of Constantine Mentouri, pp. 89-91.

la conférence mondiale sur l'enseignement supérieur, Déclaration mondiale sur l'enseignement supérieur pour le XXIe siècle : Visions et actions, , 9 octobre 1998.http://www.unesco.org/education/educprog/wche/declaration_fre.htm#declaration consulté le 27/12/2012

organisation des nations unies pour l'éducation la science et la culture,Document de travail, Conférence mondiale sur l'enseignement supérieur pour le XXIe siècle : Visions et actions, Paris,9 octobre 1998.p.2. http://unesdoc.unesco.org/images/0011/001136/113602fo.pdf consulté le 31/12/2012.

MESRS, l'Enseignement Supérieur et la Recherche Scientifique en Algérie « 50 années au service du développement 1962-2012 », p 7. https://www.mesrs.dz/ar/accueil

Scottish Journal of Arts, Social Sciences and Scientific Studies - ISSN 2047-1278
http://scottishjournal.co.uk

Evaluation of the Nutritional Potentials of Some Selected Fresh and Air Dried Local Leafy Vegetable in Nigeria

Alabi Olufunmilayo
Home Economics Department
Federal College of Education, Zaria.
funmioalabi@yahoo.com

Keswet Larai
Department of Science and Technology Education
University of Jos, Nigeria.
keswetl@unijos.edu.ng

Abstract

This paper focuses on the determination of nutrient composition of selected fresh and air dried leafy vegetables. The leafy vegetables used, were bitter leaf, water leaf, spinach, and pumpkin leaves. The result showed a high moisture content for both fresh and the air dried leafy vegetables. It was observed that the nutritive composition of fats, protein, crude fibre and ash were relatively low. The result therefore revealed that air drying method does not adversely affect the nutritive quality of the vegetables, since there was no significant difference in the nutritive value of selected fresh and air dried leafy vegetables at 0.05 level of significance. The following recommendations were made based on the findings.Individuals and families are encouraged to eat both fresh and air dried leafy vegetables as their nutritional values have no significant difference and vegetables are to be included in the daily meals in order to improve growth and development.

Introduction

People have been eating vegetables for thousands of years as both food and medicine. Leafy vegetables offer a significant opportunity for individuals and families to earn a living without large capital investments. Leafy vegetables are also important in daily meals. They are of great nutritional value and are important components of the human diet. Shei (2008) noted that leafy vegetables are a vital constituent of West African diet.

They are rich in micronutrients needed by human beings for good health, growth and development. Fayemi (2009) stated that leafy vegetables give general good health due to the presence of mineral element and vitamins. Leafy vegetables provide considerable amount of ascorbic acid, carotene, dietary fiber, iron and other minerals in addition to protein (Badifu2001). Mwangi and Mumbi (2006) noted that most widespread and debilitating nutritional disorders, including birth defect, mental and physical retardation, weakened immune systems, blindness and even death has resulted from non-consumption of vegetables.

Spinach (Amaranuscadatus), Water leave (TalinumTriangulare wild), Bitter leave (Amygdalina) and pumpkin leaf (TelfariOccidentials) are among the most famous tropical leafy vegetables in Nigeria and they are usually planted and consumed by both rural and urban populace. These four leafy vegetables are the ones used in this study. During rainy season the green leafy vegetables are in abundance and are very affordable, but in dry season they get out of stock and are more expensive.

As important as vegetables are in daily meals, they are however difficult to keep because of their perishable nature. When harvested, within 24 hours of harvesting they lose most of their nutritive qualities when not preserved. They are also subject to deterioration and decay because of the action of enzymes. The simplest method of preservation of these vegetables by both urban and rural populace is through sun dry, since there is still little commercial processing of leafy vegetables in Nigeria.

Drying removes the moisture content from the food so bacteria, yeast and mold cannot grow on it (Harrison and Andress 2000). Drying also slows down the actions of enzymes but does not inactivate them. Leafy vegetables also become smaller, lighter in weight and easy to store when dried. The use of dried vegetables improves standard of living especially when the fresh vegetables are not available or when they are too expensive.

In light of the fact that vegetables get deteriorated and are affected by microorganism which thrived under moisture content there is therefore the need for this study to be carried out to unravel the nutritional potentials of some selected fresh and aired dried local leafy vegetables to search if there is loss of nutrient after drying and to what extent the loss can be .The focus of this is on spinach, bitter leaf, pumpkin and water leaves.

Purpose of the study

The main purpose of the study was to evaluate the nutritional potentials of some selected fresh and aired dried local leafy vegetables in Nigeria.

Specifically the study:

1. Determined Nutritional value of the selected fresh vegetables.
2. Compared the nutritive value of the selected vegetables.

Hypotheses

1. There is no significant difference in the nutritive value of the selected fresh and air dried leafy vegetables.

2. There is no significant difference in the acceptability of the selected fresh and air dried leafy vegetables.

Methodology

Research Design

The vegetables were washed and separated into two equal portions .The enquiry was characterized by drying of some of the samples at the science research program of the Institute of Agricultural Research I.A.R Zaria.

Samples Used.

Leafy vegetables were obtained from Sabon-Gari market, Zaria. The samples used are 200gms each of bitter leaves, pumpkin, and water leaves. A potion was separated to be air dried while the other potion was analyzed as fresh.

Statistical Analysis

Test of significant difference in the nutritive value of selected fresh and air dried vegetables was tested at 0.05 level of significance.

Moisture and dried content of selected leafy vegetable

This was determined at the end of each drying time for dried leafy vegetable by using the weight difference method as described by standard method given by AOAC (2000). The percentage moisture content was calculated as a fraction of water removed from sample and multiplied by 100, while percentage of dried matter is equals hundred percent minus percentage of moisture content.

Percentage moisture content = water removed from sample x 100

Percentage dried matter = 100% - Percentage moisture content

Crude protein

This was determined by Cancon and Diane (2003). This involves the estimation of total protein nitrogen after conversion to ammonium salt with sulphuric acid. Each ml of 0.1MH ofHCl neutralized by ammonia is equivalent to 1.4Mg nitrogen. Percentage crude protein equals crude nitrogen multiplied by conversion factor.

Percentage crude protein = Crude Nitrogen X C.F.

Where C.F. = Conversion Factor

Crude Fiber content

This was carried out by AOAC (2000) method which involves the sequential digestion of the sample with dilute acid and alkali solution. This residue was to obtain crude fiber. Percentage of crude fiber was calculated as fraction of loss in weight on incineration multiplied by 100

Percentage of crude fiber = Loss in weight X 100

Ash and carbohydrate content

This was carried out at 555^{oc} with the acid of a muffle furnace percentage of ash calculated as a fraction residue from sample multiplied by one hundred. Carbohydrate content was estimated by the method of differences.

Furnace percentage of ash = fraction residue from sample X 100

Results and Discussion

Nutrient composition of selected fresh leafy vegetables is shown in Table 1

Table 1

Nutrient composition of selected leafy vegetables

Sample	Percentage Moisture	Percentage of crude fat	Percentage of crude protein	Percentage of Ash	Percentage of crude fibre	Percentage of carbohydrate
Bitter leave amigdaline	78.2 + 0.72	0.52 + 0.15	2.18 + 0.32	0.12 + 0.01	0.72 + 0.02	16.86 + 1
Pumpkin leave (ugwu)	79.58+ 1.05	0.54+0.02	2.14+0.50	0.10+0.02	1.20+0.02	16.74+1
Spinach Amarantus	83.12+0.72	0.55+0.01	2.16+0.50	0.14+0.02	1.40+0.02	16.76+1
Water leave T. triangles	94.87 + 0.14	0.60+0.01	1.65+0.04	0.72+0.01	0.72+0.02	3.62+0.3

The composition of the nutrient of the fresh leafy vegetables as shown in table 1 reveled that moisture content of water leaf is the highest followed by spinach, pumpkin and bitter leaf.

The nutrient composition of macro nutrient is low in fresh leafy vegetables, but they are still a good source of vitamins and minerals.

Table 2

Nutrient composition of selected leafy vegetables that were air dried.

Sample	Percentage Moisture	Percentage of crude fat	Percentage of crude protein	Percentage of Ash	Percentage of crude fibre	Percentage of carbohydrate
Bitter leave amigdaline	76.4 + 2.01	0.55 + 0.22	2.11 + 0.02	0.10 + 0.01	1.16 + 0.02	19.76 + 1.45
Pumpkin leave (ugwu)	77.10+ 1.04	0.54+0.02	2.14+0.50	0.01+0.02	1.20+0.02	1.874+1.44
Spinach Amarantus	79.89+1.18	0.57+0.02	2.63+0.05	0.57+0.01	0.54+0.02	18.7+1.0
Water leave T. triangles	82.50 + 1.50	0.51+0.01	1.40+0.03	0.65+0.03	0.72+0.03	14.22+1.22

The comparisonof table 1 and 2 revealed that there is no significant difference between the nutrient composition of fresh and air dried leafy vegetables at 0.05 level of significance. Research has shown that when vegetables are air dried the nutrient value appears to be more concentrated (Fayemi2009). While Kordyslas (2001) observed that the loss of water in air dried vegetables are minimal.

Conclusion

Leafy vegetables selected for this study had high moisture content and there is no significant difference in the nutritive value of the fresh and air dried vegetables used. As a result of low nutritive value in macronutrient, the selected leafy vegetables cannot be relied upon as a sole source of nutrient for human beings. Nutritionally, vegetables are considered as having protective functions and they serve as roughage to aid digestion both in their status as fresh or air dried vegetables.

Recommendation

The study has the following recommendations:

- Individuals and families are encouraged to eat both fresh and air dried leafy vegetables as there is no significant difference in the nutritive values of the selected vegetables.
- Vegetables should be included in the daily meals of individuals and families in order to improve their health and promote growth.

References

AOAC, (2000). Official methods of Analysis of the Association of Analytical Chemists. 5th Ed, Washington, D.C. USA.

Badifu, G.I.O. (2001). Effect of long term storage of processed Nigerian-grown edible leafy vegetables and vitamin content. *Journal of Agriculture and Food Chemistry* 39(2), 538-541.

Cancon J.M and Diane .S. (2003) Rapid micro-kjedahl digestion of cereal grains and other boiled materials. Anal Biochemists.53, 35-41

Fayemi P.O. (2009), Nigerian Vegetables. Heinemann Educational Books PLC Nigeria.

Harrison .J.A and Andress .E.C (2000) Preserving food: Drying fruits and vegetables. University of Georgia, corporative service USA.

Kordyslas J.M. (2001) Processing and preservation of Tropical and subtropical foods. Macmillan Educational Publishers, London.

Mwangi .S. and Mumbi .K. (2006), African leafy vegetables Evolves from under-utilized species to commercial ash crops. Research workshop on collective Action and Market Access for small holders 25th October 2006, Cali Colombia.

Shei .L. (2008). An Evaluation of nutritive west African Vegetables Agricultural and Rural Development. www.tropentage.de Accessed on the 24th July 2013.

Scottish Journal of Arts, Social Sciences and Scientific Studies - ISSN 2047-1278
http://scottishjournal.co.uk

Performance Evaluation of Unglazed Tiles Produced from Locally Developed Tile Making Machine

Abraham David Morakinyo
Department of Industrial Design, Federal University of Technology PMB 2076 Yola, Adamawa State

Umar Adeiza Adeika Sullayman
Department of Industrial Design, Ahmadu Bello University (ABU) Zaria, Kaduna State.

Danjuma. Sallah. Yawas
Department of Mechanical Engineering, Ahmadu Bello University (ABU) Zaria, Kaduna State

Abstract

A tile making machine (TMM) was designed and fabricated (see Plate IV), varieties of tiles in different sizes and thickness were extruded and certain properties of the tiles were also tested. This is in order to determine and certify the functional reliability of the machine and it's products when compared with similar machines earlier in operation. A body of ball (Bomo) clay and kaolin (kankara) clay in equal percentage of 50% was used for the tile extruded. Empirical method was employed to prepare the tile materials beginning with locating, identifying and charting of local deposits, exploration, procurement, transportation, beneficiation, compounding/mixing of ceramic materials, aging, production with the prepared recipes, drying and firing which mark the final stage. Tensile, hardness and impact resistance tests were carried out on the tiles produced with the TMM and two ready-made glazed China tiles in the market. The produced tiles results on the tensile test were (20mm = 1311.06 N/ mm^2, 15mm = 951.78 N/ mm^2 and 10mm = 741.47 N/ mm^2); hardness test: (20mm = 40.2 HRF, 15mm = 29.7 HRF and 10mm = 18.7 HRF); and impact test: (20mm = 5.5J, 15mm = 2.13J and 10mm = 0.63J). The two results compared showed significant relationship in the parameters measured. Even though tiles produced from the TMM machine were not glazed but they met the standard parameters for unglazed tiles as obtained in literatures. From the parameters measured and the results obtained these tiles suitably match with the klinker tiles used as floor tiles and for other hard lining surfaces.

Keywords: Test, Performance, Efficiency, Standard, Unglazed, Mechanical

1. Introduction

Tiles, as a product type of structural ceramics are manufactured using the industrial ceramic process. This is a controlled process of ceramic manufacturing in which mass production of identical wares can be achieved. Industrial ceramics is also the science and technology of designing, formulating and manufacturing ceramic products that have industrial and technical utilities, (Sullayman, 2008). Tiles can be pressed, extruded or cast. Tiles range from wall tiles (such as decorated wall tiles, faience tiles, stove tiles, cottoforte tile, porous single-fired tiles, and exterior wall tiles), to floor tiles (such as quarry tiles, stone tiles, klinker tiles and mosaic tiles) as well as porcelain tiles. Tiles are most often made from ceramic, with a hard glaze finish. But other materials are also commonly used, such as glass, marble, granite, slate, and, kaolin, and are usually formed into a ceramic slurry, which is cast in a mould and fired.

The hardness of ceramic tile is rated from zero to five according to the Porcelain Enamel Institute (PEI) scale. According to www.crossville-ceramics.com 2009) and (Matteucci, et al 2002 in Luz and Ribeiro (2006) the PEI rating determines the suitability of ceramic tile for various surfaces. A rating of zero indicates that a tile is not suitable for use on walls. Such tiles protect walls of buildings and floors and retain their shapes, aesthetic quality and enhanced durability in any surface where they are used. Tiles are also used for surfaces, for antiseptic and hygiene purposes, as well as combine sufficient cleanliness with suitable electrical properties. Ceiling tiles are placed on a steel grid and, depending on the tile selected, may provide thermal insulation, sound absorption, enhanced fire protection, and improved indoor air quality. Some are approved for use in food preparation areas, and some are certified for indoor air quality by the Green Guard Institute (GGI). There are also tiles that are resistant to mould and moisture damage that have enhanced acoustical properties (American Society for Metal (ASM) 1992).

In the last two decades, the technology of producing porcelain and glass tiles has become more efficient, allowing more mass production. Because of the invention of automated tile lines and state of the art equipment, that use diamonds to cut and finish stone slabs into tiles, it has made stone tiles more available. The invention of automated tile lines and state of the art equipment has allowed tiles to move from being small business into broader markets (www.infotile.com/publications, 2009) and (http://www.encyclopedia.com) in (Morakinyo, 2012). The two contributors above further revealed that the technical properties of tiles are also available for consumption because of technology that is available. This makes tiles production/selection for use on any surface easy without much difficulty.

Nigeria as a nation lags behind in regards to the production of industrial ceramic wares - like tile production. This is because most of the productions are done manually due to lack of requisite machines and equipment. The availability of such needed machines will increase the scope of functions in industrial ceramics and make production easier.

A tile making machine was developed and several varieties of tiles in different sizes and thicknesses were produced. Relevant property tests of the tiles were also conducted. This is in order to determine and certify the functional reliability of the machine and it's product with in comparism with similar machine already in existence elsewhere in the world. This study therefore, is geared towards the design and fabrication of TMM, evaluate the results, and bring to fore necessary findings base on the potentials in ceramic equipment design and fabrication in Nigeria. The availability of this machine is an answer to the quest for locally produced machines that can manufacture ceramic products which can compete favourably with similar machines made outside the nation.

1.1. Tiles and Their Functional Definition

Tiles can be defined according to their types. Drews, (1983) stated that ceramic floor and wall tiles include all ceramic products used as wall and floor covering, tiles and components for swimming pools, as well as relevant accessories.

Ceramic Wall and Floor Files:- Uni, (1985) says the European standard EN87, approved in Nov. 1981 specifies that "ceramic wall and floor tiles are building materials that are generally designed for use for floor and wall. These are coverings, for both indoors and outdoors. Regardless of their shapes and sizes, these are manufactured by standard ceramic processes and prepared from mixture of ball clays, sand, fluxes, colouring agents and other mineral raw materials. Tiles raw materials are processed by milling, screening, blending and wetting. The shaping of tiles is carried out either by pressing, extrusion, casting or other processes normally at room temperature. After shaping, tiles are subsequently dried and fired at high temperature by single or two stage firing- glazed which are unglazed or engobed.

The definitions below are given by American National Standard Institute Specification for ceramic Tile (ANSIA137.1) as in their types and functions:

a. Ceramic Mosaic Tile:-- Decorative Wall Tile: -- Paver Tile: -- Porcelain Tile: --

b. Quarry Tile: -- Wall Tile: --Individual Tile White Ware Grades: --

1.2. Classification of Ceramic Tiles

It is on record that many classifications have been proposed to define tiles. Some are classifications of usage or based on the characteristics of the starting materials or firing cycle. Drews, (ibid) recorded that it is difficult to give exhaustive classification owing to the extreme heterogeneity of tile products, yet they are still categorized thus:

- ***Red Ware and White Ware —*** Red and white tiles are different based on the amount of iron content. The iron reacts with other body's components which gives more or less colouration and modify the behaviour of the body in firing. (Nassetti, 1985).
- European (EN) and America Society for Testing and Materials (ASTM) standards, classify ceramic tiles based on the function of water absorption and shaping method.

I. ***Tiles Classify by Shaping process***: the tiles classify by shaping process are also divided into three (a). Extruded floor tile :- these includes split tiles and individual extruded tiles. (b). Dry-pressed floor and wall tiles and (c). Cast floor and wall tiles.

II. ***Tiles classify by Water (H_2O) absorption:*** This is directly related to porosity and it is represented with E, expressed as a mass fraction given as a percentage:

   a. Group I (low H_2O absorption) where $E \leq 3\%$

   b. Group II (medium H2O absorption) where $3\% < E \leq 6\%$, (Group IIa) where $6\% < E \leq 10\%$ (Group IIb)

   c. Group III (high H_2O absorption) where $E > 10\%$.

- **Shaping process and water absorption:-**These parameters are directly related to the physical, chemical, mechanical and micro-structural properties such as:

modulus of rupture of fired tiles; abrasion resistance; chemical resistance; frost resistance.

Benlloch *et al* (1981) further deduced that most of the tiles available in the market are single fired or twice-fired. Such tiles are made up of the basic components listed below: they are clay minerals; inert materials, such as feldspars, and pegmatite. Others are calcite dolomite & other oxides etc.

However, some specialized bodies for specific applications contain other components, such as alumina in certain porcelains and bone ash in bone china. Cubbon and Till (1983) said most tiles and floor white ware bodies are prepared by single firing technology, which steps were specify by Dardi et al (1990) which are as follows: batching – grinding - spray-drying – pressing - dying - glazing and firing. With the following steps above varieties of tile, types can be produced with diverse applications.

Clay (primary and secondary clays) was the major material use to produce the tiles in this study. The steps for the preparation were similar to the steps mentioned by Cubbon and Till (1983) above, this however exclude the spray drying; the tiles were also prepared for two firings.

2. Materials and Method

The major material used for the tile production is clay. The clay for tile has different compositions depending on the type of tile to be made. The body used for this research is composed of two major materials: namely clay; and kaolin in different, compositions to determine a suitable and workable body. Clay and kaolin in ratio 50:50 was used.

Clay- Basically can be classified into two types: primary clay and secondary clay. Kaolin is less plastic and contains larger particle size. It is white in nature and fires at an extremely high temperature. Monteiro *et al.* (2003) in Alkali (2009) said the kaolinitic nature and the presence of high percentage of aluminium hydroxide confers a refractory behaviour on kaolin which impairs sintering during firing in some cases. This, he said results in the greater porosity associated with elevated values of water absorption of primary clay and reduces the mechanical strength of forms at green ware stage.

In preparing the tile material, empirical method was employed as stated by (Morakinyo 2010). This method begins with locating, identifying and charting of local deposits, exploration, procurement, transportation, beneficiation or treatment (ball milling/grinding, drying, sieving and measuring), compounding and mixing of ceramic materials, aging, application “or” production with the prepared recipes, drying and firing which mark the final stage (see Fig.1) :

From this tile body, different tile sizes and shapes were extruded from the fabricated tile making machine. These tiles were in sizes of 20x20cm, 15x15cm and 10x10cm; with varied thickness of 20mm, 15mm, 12mm and 10mm.

2.1. Performance Evaluation of the Unglazed Tiles Produced

The extruded tiles were mechanically evaluated after firing.

When in service, ceramic tiles are subjected to forces or loads. It is necessary to know the characteristics of the material and to design the member from which it is made such that any resulting deformation will not be excessive and fracture will not occur. The mechanical behaviour of a material reflects the relationship between its response and deformation to an applied load or force. (William 1996). Important mechanical properties to ascertain in tile production are strength, hardness, ductility, and stiffness.

Mechanical properties of tile are ascertained by performing carefully designed laboratory experiments that replicate as nearly as possible the service conditions. Mechanical properties are of concern to a variety of parties like the producers, consumers, research organisation, government agencies and many more.

Tiles' body are frequently chosen for structural applications because they have desirable combinations of mechanical characteristics. This helps to understand the material, its mechanical behaviours, relationship with others and its service requirement (William, ibid).

Three mechanical tests were carried out on the tiles produced from the TMM, these are: tensile strength, impact resistance and hardness tests. The test results were compared to two existing glazed tile samples from China. Chappy Impact Testing Machine was employed to carry out the impact test, while "Indentec Universal Hardness Test Machine" was used to carry out the hardness test on F scale. The Rockwell test was performed on F scale as designated with minimal load of 10kg and total of 60kg, as given by (William, 1996).

The averages of the three tests carried out for each thickness was calculated. While on the tensile strength the result was deduced by using the correlation between hardness and tensile Strength.

3. Results and Discussion

Three mechanical property tests were carried out on the tiles extruded and bisque fired (unglazed): tensile strength, impact and hardness tests; these results are shown in Fig. 2,3 and 4.

3.1. The Comparative Impact Test Results of The Two Glazed (China Tiles) and Unglazed Tiles

From Fig. 2. it shows that the hardness of a glazed tile is twice or much stronger than when it is bisque. In other words glaze on tile turns glassy; it's body rocky, metallic and somewhat seemingly unbreakable. This is because the particles become denser, vitrified and less or non-porous. Encyclopædia Britannica (2013) said the role of the glassy liquid phase in the consolidation of fired clay objects is to facilitate liquid-phase or reactive-liquid sintering. In these processes the liquid first brings about a denser rearrangement of particles by viscous flow. Secondly, through solution-precipitation of the solid phases, small particles and surfaces of larger particles dissolve and re-precipitate at the growing "necks" that connect large particles. Rearrangement and solution-precipitation lead to bond formation and to progressive densification with reduction of porosity. A range of glass contents and residual porosities can be obtained, depending on the ingredients and the time the object is held at maximum temperature.

This suggest that if the TMM tiles were glazed fired they would be much denser, bonded and less porous. This will also mean that in Table 1 above the impact value of 'a' and 'b' will increase while that of 'c' could be the same as the impact value of the glazed China sampled tiles.

3.2. The Comparative Hardness Test Results of The Two Unglazed and Glazed Tiles

From Plate I toIII these shows that the tiles produced from the TMM are thicker and unglazed but, 'a' in Table 2 of the unglazed tiles can in terms of hardness stand side by side with the China tile samples A and B. These results suggest that if the 10mm of TMM tile was glazed it could have the same value in terms of hardness test with the China tiles that are glazed. This also suggests to some certain extend that these tiles can be used hand in hand on the floor where the two China samples will function.

3.3. The Comparative Tensile Test Results of The Two Unglazed and Glazed Tiles

The results of the TMM tiles and the sample China tiles will almost be the same if the TMM tiles were fired for the second time to a glazed temperature.

The two tests carried out on the tiles produced with the TMM and the glazed China tiles shows significant relationship in the parameters measure. Even though tiles produced from the TMM machine were not glazed but these met the stipulated standards for unglazed tiles on the three tests carried out. More to that with the parameters measured and the results obtained the tiles will suitably match with the klinker and quarry tiles used as floor tiles and likewise for other hard lining surfaces. Tiziano and Gian (1991) advanced that klinker and quary tiles are larger and thicker this brings about high mechanical strength, abrasion resistance, impact resistance and frost resistance. Subsequently if the TMM tiles go for the second (glaze) fired the 10mm size can function and fit where the two samples A and B China tiles will fit and function.

Glazing of the TMM tiles will to a greater extent make them have the same value like that of the Sampled Glazed China Tiles. This suggest that the functions and technical properties will not be different thereby making such tiles compete favourably with any other tile industrially produced with the results obtained above.

4. Conclusion

The result of this research work is actually instructive and stimulating for further study. But it is evidence that the TMM tiles produced in equal percentage of 50% each of Kaolin and Secondary (Bomo) clay is a good body for tiles production. The material use can actually be further harness and with a little refinement serve in conserving and bringing foreign exchange.

If more materials are introduce to this body like silica, feldspar or Talc or other relevant tile making materials a better body can emerge. If this is use to produce tiles and fired to a glazed temperature, these tiles will function as any other industrial tiles available.

This suggest that a technology has actually evolve that will list the local ceramist and engineers among their colleagues world over. This is actually a research in a research.

Acknowledgement

The authors would like to recognise the supplementary financial support extended by the Educational Trust Fund (ETF) Nigeria, through the Department of Research and Development FUT-Yola. We also appreciate the Technical Staffs of both Industrial Design Programme, Abubakar Tafawabelewa University Bauchi (ATBU) Bauchi, Nigeria and

Department of Industrial Design, Ahmadu Bello University (ABU) Zaria, Nigeria for the usage of their equipment in carrying this research. We will not fail to acknowledge the immerse contribution of the Head of Department and Mr. Yusuf the Chief Technical Officer of the Department of Metallurgy ABU Zaria, Nigeria for granting permission and the later in using their equipment to carry out the three major tests on the extruded tiles.

References

America Society of Metal (ASM) International (2003). *Trends in Welding Research*. Materials Park, Ohio: ASM International.

Alkali, V. (2009) Exploration of The Potentials of Granite Sawing Waste in Developing Ceramic Body and Glazes. A Ph.D. Second Seminar Paper Presented September, 2009 in the department of Industrial Design ABU Zaria.

Benlloch, A. E., Amoros J. L. and Navarro J. E. E. (1981). Studio de Eres Parra Pavimento. Boll Soc. Es. Ceram. Rid., Vol 20, 1981, p17-24

Cubbon, R.C.P. and Till J.R. (1983). Preparation of Ceramic Bodies, Ceramic Monographs-Handbook of Ceramics, Verlag Schmid GmbH, Freigurg, 1983.

Dardi M., Brusa, A. and Bresciani A. (1990). *Single Fired Stoneware Floor Tiles, Int. Ceram.* J., Vol 451990, p 22-31

Drews, S. M. (1983). Wall and Floor Tiles, Ceramics monographs-handbook of Ceramics, Verlleg Schimid Gmbh, Freiburg, 1983.

http://www.encyclopedia.com/doc/ceramictile1G2-2896500032.html.Retrived 17-07-2012.

Luz, A. P. and Ribeiro, S. (2006). Use of Glass Waste as Raw Material in porcelain Stoneware tile Mixtures; Faculty of Chemical Engineering of Lorena (FAENQUIL), Department of Materials Engineering (DEMAR), Polo Urbo Industrial, Gleba A16, CP 116, 12600-970 Lorena, SP, Brazil. (www.elsevier.com/locate/ceramint). Ceramic International 33 (2007) 761-765.

Matteucci, F; Dondi, M; and Guarini, G. Effect of Soda-lime Glass on Sintering

and Technological Properties of Porcelain Stoneware Tiles, Ceram. Int. 28(8) (2002) 873–880.

Monteiro, S.N. Pecanha, L.A. Vieira, C.M.F. (2003): Reformulation of Roofing Tiles Body with Addition of Granite Waste from Sawing Operations. Journal of the European Ceramic Society 24 (2004) 2349–2356.

Morakinyo, A. D; Gadzama R.M; Kawahya P.D, and Umar A. (2010) Exploration of Ceramic Raw Materials in Yola, Adamawa State for the Production of Ceramic Glazes, in *Ashaku Journal of Ceramic*. June, Vol.8, p. 54-63

Morakinyo, A. D. (2012) Design and fabrication of a Tile Making Machine (TMM). (Unpublished Masters thesis) submitted to the Department of Industrial Design ABU Zaria.

Nassetti, G. (1985). Thermal energy Consumptions in the Production of Single Fired Red Ware. Tendedcies and Considerations, Inter Ceram, Vol 34 (No. 4), 1985, p 40-41

Sullayman, U. A. A. (2008). The Processing Technologies and Product Types of Industrial Ceramics: Advantages Over Traditional Manufacturing Routes. A seminar paper presented June, 24th 2008 in the Department of Industrial Design ABU Zaria.

Tiziano, M and Gian C. P.(1991). Tile Whiteware: Department of Chemistry University of Modena, Italy. Engineered Materials Handbook. Glass and Ceramic Vol. 4 America Society of Metal (ASM). International

Traditional Ceramics**.** (2013). Encyclopædia Britannica. *Ultimate Reference Suite.* Chicago: Encyclopædia Britannica.

Uni "Piastrelle di Ceramica per Rivestimanto di Pavimenti e Pareti", Nerme Europe, Uni, Milano, 1985.

William, D. C. (1996). *Material Science and Engineering: Introduction* (4th ed) United States of America, JohnWhiley ans Sons, Inc.

www.Crossville-Ceramics.Com, 2009. Retrived 15th July, 2012

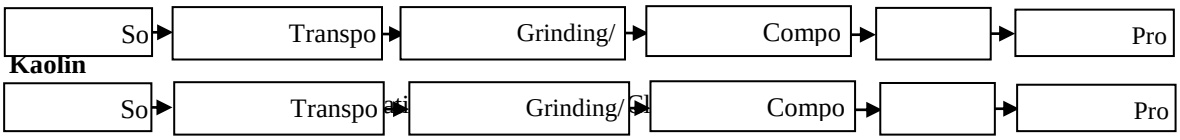
www.infotile.com/publications,2009

About the Authors

Abraham David Morakinyo is a Lecturer at the Department of Industrial Design, Federal University of Technology, Yola, Adamawa Sate, Nigeria. He is a member of Ceramic Association of Nigeria (CeRAN) and member of International Journal of Design (IJD). He holds a Master of Arts (M.A.) in Industrial Design from Ahmadu Bello University (ABU) Zaria. His research interests are in ceramic and creative design, ceramic materials, machine design, modeling, fabrication and production.

Umar A.A. Sullayman is a Professor in the Department of Industrial Design, Ahmadu Bello University (ABU) Zaria, Kaduna State, Nigeria. He holds a Ph.D. degree in advance ceramic science and materials. He was the former Head of Industrial design ABU Zaria.

Danjuma S. Yawas is an Associate Professor in the Department of Mechanical Engineering, Ahmadu Bello University (ABU) Zaria, Kaduna State, Nigeria. He holds a Ph.D. degree in advance ceramic science and materials. He was the former Head of Mechanical Engineering ABU Zaria. His research interest are in production engineering, machine design and fabrication



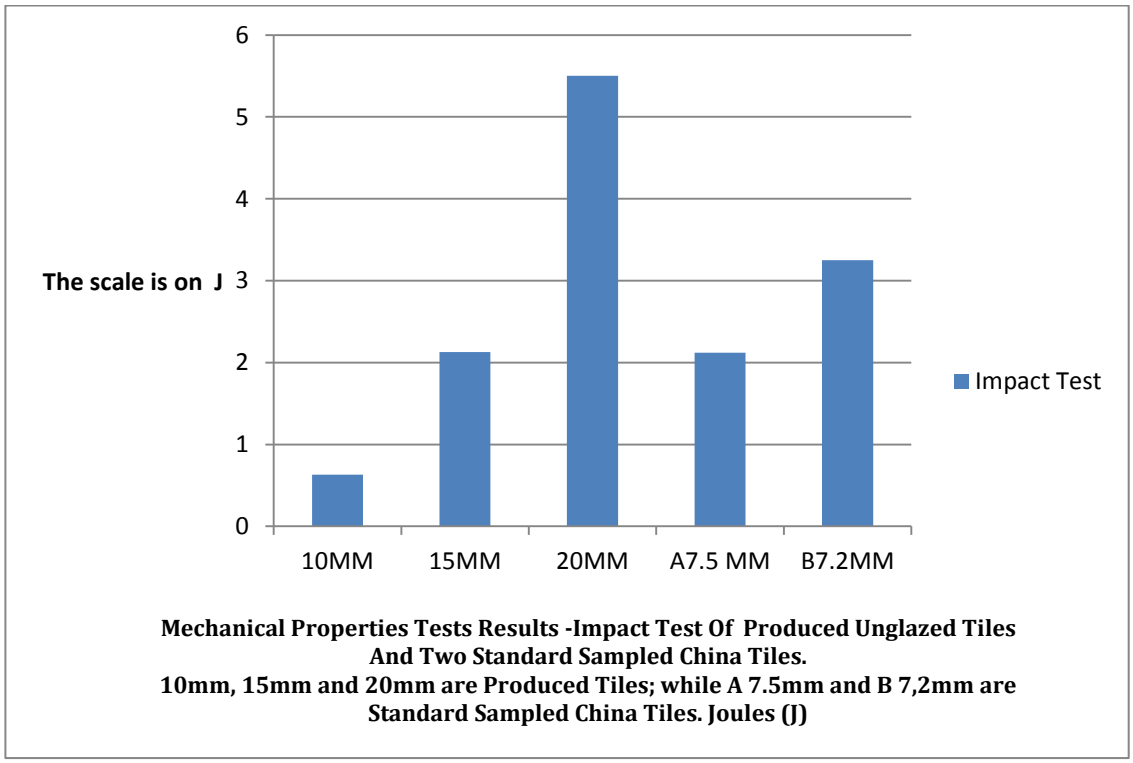


Fig. 2. Impact Tests Results of Unglazed and Two Standard Glazed Tiles

Source: Morakinyo, (2012)

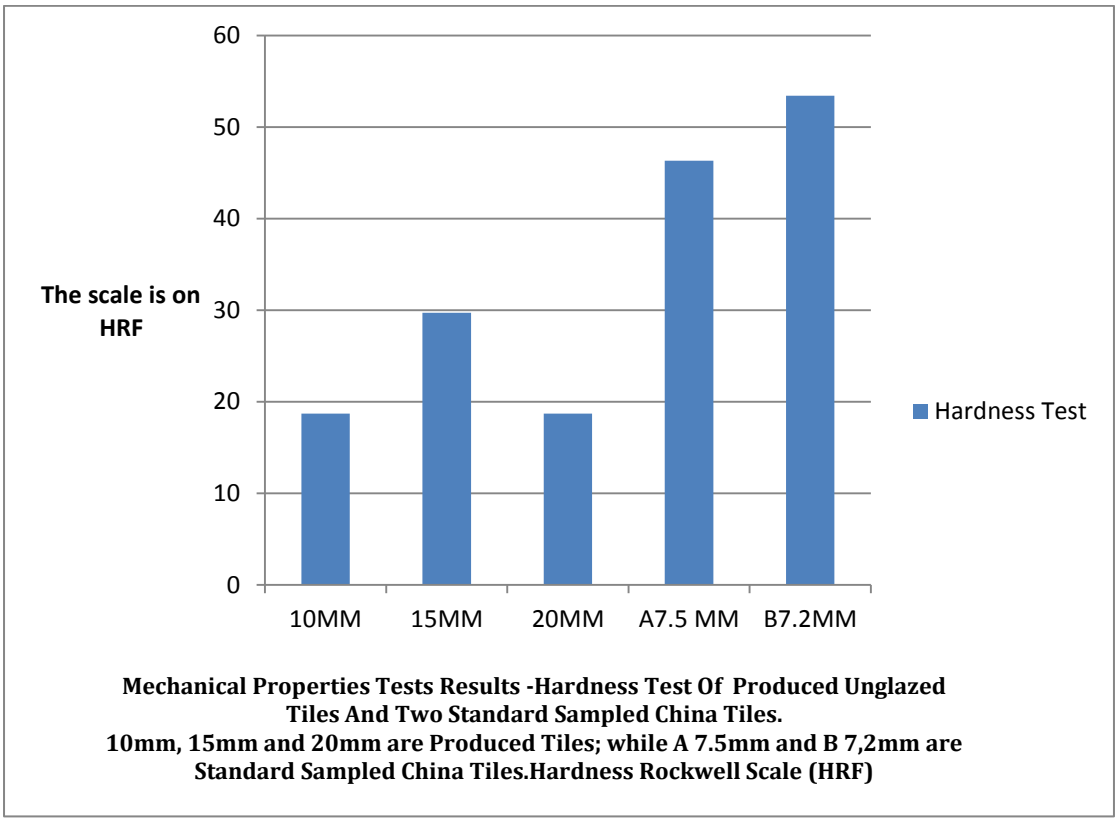


Figure 3. Hardness Test Results of Unglazed and Two Standard Glazed Tiles
Source: Morakinyo, (2012)

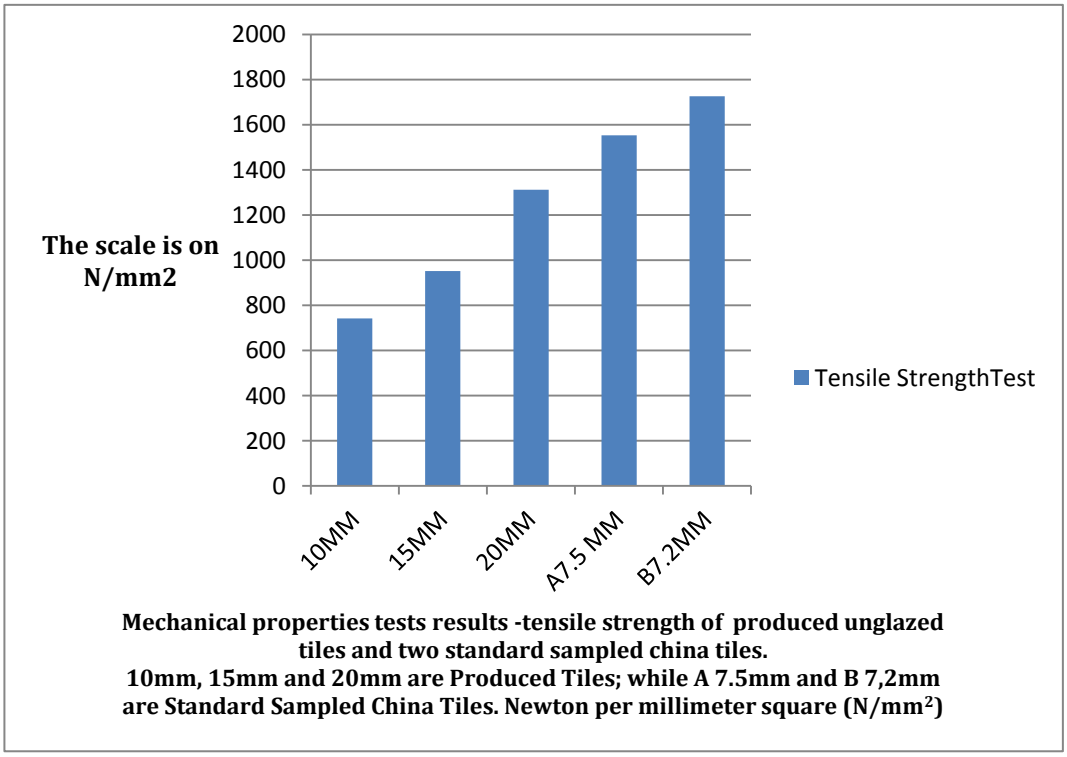


Figure 4. Tensile Strength Test Results of Unglazed and Two Standard Glazed Tiles

Source: Morakinyo, (2012)

Table 1. TMM Unglazed Tiles and Sampled Glazed China Tiles Impact Test Results

S/N	TMM UNGLAZED TILES IMPACT TEST RESULT	CHINA GLAZED TILES IMPACT RESULT
1.	**a.** 20mm thickness = 5.5J	**a.** Sample A 7.5mm thickness = 2.12 J
	b. 15mm thickness = 2.13J	**b.** Sample B 7.2mm thickness = 3.25 J
	c. 10mm thickness = 0.63J	

Table 2. TMM Unglazed Tiles and Sampled Glazed China Tiles Hardness Test Results

S/N	TMM UNGLAZED TILES HARDNESS TEST RESULT	CHINA GLAZED TILES HARDNESS RESULT
1.	**a.** 20mm thickness = 40.2 HRF	**a.** Sample A 7.5mm thickness = 46.3 HRF
	b. 15mm thickness = 29.7 HRF	**b.** Sample B 7.2mm thickness = 53.4 HRF
	c. 10mm thickness = 18.7 HRF	

Table4. TMM Tiles and Sampled China Tiles Tensile Test Results

S/N	**TMM UNGLAZED TILES TENSILE TEST RESULT**	**CHINA GLAZED TILES TENSILE RESULT**
1.	a. 20mm = **1311.06 N/ mm^2**	a. Sample A 7.5mm thickness =**1552.83 N/mm^2**
	b. 15mm = **951.78 N/ mm^2**	b. Sample B 7.2mm thickness = **1725.36 N/mm^2**
	c. 10mm = **741.47 N/ mm^2**	

Plate I: Unglazed Tiles in variety of sizes

Source: Morakinyo 2012

Plate II: Fired Tiles up to a Temperature of 1100^{o}C Arranged on a Table after Firing 20 x20 cm.

Source: Morakinyo, (2012)

Plate III: Fired Tiles (Unglazed) up to a Temperature of 1100^{o}C arranged on a Table after Firing 15 x15 cm.

Source: Morakinyo, (2012)

Plate IV: The Developed Tile Making Machine During Production

Source: Morakinyo, (2012)