INVESTIGATING LOCAL ITEM INDEPENDENCE IN CIVIC EDUCATION MULTIPLE-CHOICE ITEMS OF JOINT MOCK EXAMINATION

Mohammed Idris JIMOHa* and ** Rashidat ABDULSALAM-NUHUb
[b]rashidat.omotayo@uniabuja.edu.ng,
aDepartment of Social Sciences Education, Faculty of Education,
University of Ilorin, Ilorin, Nigeria;
bDepartment of Educational Foundations, Faculty of Education,
University of Abuja, Abuja, Nigeria
*corresponding author ajimoh.mi@unilorin.edu.ng,
a+234(0)8038513894
ahttps://orcid.org/0000-0002-5991-1656

Abstract: *In preparation for external examinations, Senior Secondary School II students write joint mock examinations in core subjects including civic education. The study examined into the authenticity of civic education test multiple-choice items. A post-hoc research design was used. The population included all public school senior secondary I, II, and III students, whereas the target population included 2020/21 SSS II students. The Kwara State Ministry of Education and Human Capital Development created a 50-item multiple-choice item for the research. At different stages of selection, stratified, proportionate, and simple random sampling techniques were used. Using tetrachoric correlation statistics, one research question was posed and answered. Based on the thumb rule of 0.3, 41 of 50 items favored local item independence. Local item dependency should be taught as part of psychometric properties in undergraduate and postgraduate programs.*

Keywords: *civic education; investigating; joint mock; local item independence; multiple-choice*

Introduction

In the senior secondary school, civic education subject, students are exposed to a sequence of instructions in any learning context. The subject was introduced into the primary and secondary school curricula to allow students to acquire and develop knowledge, skills, and attitudes that will enable them to recognize individual rights and responsibilities as citizens of the Federal

Republic of Nigeria. The following are the civic education objectives in Nigeria's Senior Secondary School curriculum (Nigeria Educational Research and Development Council, 2013): (1). Promoting the understanding of the inter-relationship between man/woman, the government and the society; (2). Highlight the structure of government, its functions and the responsibilities of government to the people and vice-versa; (3). Enhance the teaching and learning of emerging issues; and (4). Inculcate in students their duties and obligations to society.

Based on the stated objectives, the following themes are expected to be covered within three years of academic sessions. They are as follows: Civic education focuses on values, citizenship education, nationalism, human rights, law and order: respect for constituted authority, responsible parenting, traffic regulations, inter-personal relationships, cultism, drug and drug abuse, human trafficking, HIV and AIDS, youth empowerment, government structure and functions, democracy, rule of law, and national development, political apathy, civil society, and popular participation (Nigerian Educational Research and Development Council, 2013).

Civic Education, like all other secondary school subjects in Nigeria, is expected to be studied for three years, during which during which students must be tested by their teachers using classroom tests before being exposed to external examinations. It is expected that learners will be evaluated at the end of the program to determine their level of success in the learning activities. The Kwara State Government prepares Senior Secondary II students on a yearly basis prior to the end of the program, and students are therefore required to sit joint mock examinations. This is meant to get them ready for external examinations such as the West African Examinations Council (WAEC), the National Examinations Council (NECO), and the National Business and Technical Examinations Board (NABTEB).

The already established principles of test construction must be followed for any test to be valid and reliable. This is done to make sure that the test items are free of ambiguities, which might lead to an above-average student performing much better on the exam. There are two kinds of tests: (1) free-response (essays and short answers) and (2) close-response (e.g., multiple choice, filling the gap, and matching response). As a matter of fact, the Kwara State Ministry of Education and Human Capital Development generated joint mock civic education multiple-choice items for this study.

There are two well-known measurement theories (Classical Test Theory and Item Response Theory). The assumptions of said IRT were central to this study. The Item Response Theory (IRT) is a model for expressing the relationship between a specific teste's response to an item and the underlying latent variable (often known to as ability, proficiency, attitude, and so on) that the instrument measures. In IRT, there are three assumptions (dimensionality,

local independence, and monotonicity) of the Item Characteristic Curve (ICC). Item response theory is based on the dimensionality of test items. It states that a score can only be meaningful if the set of items measures only one attribute or dimension. As a matter of fact, we may have both unidimensional and multidimensional test items. If a test is made up of items that measure more than one thing,

However, in IRT, it is assumed that a test could measure only one trait (e.g. ability), and thus is referred to as unidimensional. It stipulates that the test or assessment instrument should assess a single, unified underlying trait or construct (Ziegler & Hagemann, 2015). It relies on the assumption that all items in a test have one common ground. One-dimensionality focuses on dichotomously response items either with correct or incorrect answers.

The assumption of one-dimensionality implies that a test item can only measure one trait at a time. It assumes that the performance of a teste can only be explained by a single latent trait. It assumes that items in a test are expected to measure only one latent trait and that any other factors that influence an item's response are treated as random errors or nuisance to the model. When a test measures more than one construct, it is referred to as multi-dimensional. Since the IRT model doesn't really fit the data, it cannot be used to estimate examinee ability and item characteristics.

Another assumption is the Item Characteristic Curve (ICC) known as is monotonic. It is a function if the slope of the curve is continuously and consistently increasing and the values never drop or increase. In comparison, if the slope of the curve is continuously decreasing, it will never increase or decrease. According to Hambleton (2012), examinees with higher trait scores have a higher probability of correctly answering an item than examinees with lower trait scores.

Another assumption is local item independence or item autonomy. It is based on the concept of conditional probability (Moghadam & Pishghadam, 2008). Local item dependency is also recognised as conditional independence (De Ayala, 2010). The assumptions imply that the items in a test should not be related in any way (Pourya & Reza, 2008). It is the probability of an examinee correctly answering a test item that is not dependent on the examinee's answers to other test items. An item does not provide any clues for correctly answering another item. All items in a test should be independent of each other.

The local item independence assumes that the probability of an examinee getting item correctly is not affected by the answer (response) given to other items in the test. The principle of local independence requires that responses to different items are uncorrelated when θ (the person's ability) is fixed (Elias, et., al, 2006). For instance, if the responses to one item structurally compel the possible answers to other items, then the items are not

locally independent (Courville, 2004). That is, a correct or wrong response to one item should not lead to a correct or wrong response to another item (Monseur et., al, 2011 and Ayanwale, 2017). If local dependence does exist, a large correlation between two or more items can essentially affect the latent trait and it causes lack of validity. Local Item Independence (LID) assumes that no two items in a multiple-choice test should be alike (Wang et., al., 2005). The response to one item should not have a positive or negative impact on the responses to the other test items. It must be noted that, if two items are locally independent, the success or failure of the test-taker on one item is not affected by the probability of getting the other item right or wrong, when the ability level of the test-taker has been taken into consideration.

It should be noted that there is a possibility that a test might violate the assumption of local item independence, which again is known as local item dependence. Local item dependence refers to significant correlations between items after the latent trait's contribution is removed. Local item dependence is more applicable to free response test items; however, if detected in multiple-choice items, it may outcome in a biased estimation of the difficulty parameters, an overestimation of item discrimination, a bias on the variance estimate, and an overestimation of test reliability (Monseur et., al, 2011). Use local item independent to investigate the quality of joint mock civic education multiple-choice items in this study.

There are two approaches to investigating LID (i.e., stochastic LID and statistical LID). The test-takers' responses are not utilized to determine Local Stochastic Independence (LSI). The test-reaction takers to item 1 is independent of his or her reaction to item 2 and any other items (Sijtsma & Molenaar, 2002). As a result, the expected reaction to any given item is unconnected to the responses to other items. It is presumed that in yes-or-no-response items, one item must not be dependent on the other items.

Local item independence is statistically determined by the test-takers' responses. It refers to a situation in which each test-responses takers to multiple-choice items are independent of one another. In other words, the response to one item has no direct effect on the response to another (Ibrahim, 2017). Based on the assumption, multiple-choice items on a test should not be related to one another. Embretson & Reise (2000).

Various authors and academicians have suggested a variety of statistical approaches for gauging local item independence. One method of determining local item independence is to employ the fit measure Q2 (Van den Wollenberg, 1982). It is derived using contingency tables and the features of the Rasch model (Christensen et., al, 2017).

Tetrachoric correlation, which is a biserial correlation, is another statistical approach. The two elements have a biserial relationship. Lord (1980) proposed testing the premise of local item independence using

tetrachoric correlation statistics. The tetrachoric assumes bivariate normality for latent response variables underlying a pair of dichotomous measurements. It indicates how strong or weak the relationship between the ratings of two things is. A "0" represents an incorrect response, while a "1" represents a correct response (Kotz & Johnson, 2006). This is based on the premise that the lower the tetrachoric correlation between items, the greater the items' local independence (Ubi, et al., 2011).

Another method for determining local item independence is the Pooled-Across-Group (PAG) method. It is formed on a pooled inter-item correlation matrix of examinees with similar raw scores. Using the PAG approach, examinees are classified into homogeneous groups based on their raw results across the entire test form. Within each group, the inter-item correlation matrix is computed. The matrices are therefore pooled across all groups. The mean of the pooled correlations within one cluster is employed to determine the PAG index of local item dependency for each item cluster (Huynh, et al., 1995).

Partial correlation is another method of identifying local item independence. It requires the computation of the inter-item partial correlation matrix with the total raw score being partial. The computational process is carried out as follows. On item "j" let X_j be the item raw score, E_j is the corresponding predicted value from the linear regression on the raw score of the total test, and let $D_j = X_j - E_j$ be the residual score. Then the partial correlation for items j and "J" is the correlation between the two residuals D_j and D_j taken over all examinees. (Huynh, et., al,1995).

In the same vein, local item independence could be assessed via one-dimensionality of the test items with the understanding that all unidimensional test items are equally locally independent (Ubi, Umoinyang & Joshua 2011). Yen Q3 statistic could also be used to assess local item dependency. Yen index of local item dependence is computed via a correlation matrix (Huynh, et., al, 1995).

Other methods (Debelak & Koller, 2019), such as the approaches to logistic regression reviewed by Kim, De Ayala, Ferdous, & Nering, are available (Debelak & Koller, 2019). (2011). DIMTEST is also used to determine item independence on a local level. It's worth noting at this point that there are currently no well-documented claims that one statistic is superior to the other. As a result, the tetrachoric correlation statistic was used in this investigation.

Several academic research projects on local item independence/dependence have been conducted both within and outside Nigeria. For instance, Onuka (2011) investigated item local independence in WAEC (SSCE) Economising Ajerorni-Ifelodun Local Government Area, Lagos State. The tetrachoric correlation was employed to find locally

independent Economics multiple-choice test items in the 2010 West African Senior School Certificate Examination.

Ubi, et., al, (2011) studied item local independence in selection examination in Nigeria. The tetrachoric correlation test statistical approach was used to analyze the data. One of their conclusions was that JAMB-UME mathematics from 2000 to 2003 matched the local independence assumptions of Item Response Theory (IRT).

For the complexity of the multidimensional dataset, Busari & Busari (2020) compared local item dependency from the inter-item correlation matrix and principal component analysis from factor analysis. The local item dependency and independence of 2013 WASSCE financial accounting were determined using the inter-item correlation statistical approach. The findings revealed that 34 (77.3%) of the 44 items exhibited local item reliance, 7 (15.9%) were locally independent, and 3 (6.8%) had weak local dependence.

In Lagos State, Nigeria, Alade, et., al, (2020) evaluated the dimensionality and local independence of WASSCE 2018 Mathematics objective test scores. To find local independence items, the Yen Q3 statistic correlation residual was employed. According to the findings, 28 of the 50 items in the 2018 WASSCE mathematics multiple-choice test violated the assumption of local independence.

Statement of the Problem

The motivation for carrying out this study was the researchers' observations that there have been fluctuations in the performance of Nigerian students in both internal and external examinations. This has been a source of concern and worry to the stakeholders (parents, educators, government, examination bodies, students and researchers). The annual announcements of WASSCE, NECO, and NABTEB results confirm this. The West African Examinations Council, for example, reported that 65.24 per cent of applicants received credits or above in a minimum of five courses in 2020, including English Language and Mathematics (Online Premium Times, November 2, 2020).

The candidates' inability to perform better has been attributed to several problems, including instructor personality, insufficient government funding, insufficient infrastructural facilities, a lack of use of current instructional strategies, and persistent growth in class size, to name a few (Anigbo, 2016). Aside from these characteristics, few studies have been conducted to determine the quality of test items used to assess students' abilities. It seemed to the researcher that this could be another element affecting pupils' academic success. The study studied items that are locally dependent on civic education binary-response questions designed based on these premises.

119

Purpose of the Study
The primary goal of this study was to assess the quality of civic education multiple-choice test items developed by the Kwara State Ministry of Education and Human Capital Development and administered to public Senior Secondary School II students in a joint mock in the 2020/2021 academic session.
(a)   The study examines plausibility of local item dependence of Civic Education   Multiple-Choice   Test   Items   constructed in   2020/2021 academic session.

Research Question
        One research questions were raised as follows:
a)   To what extent do the 2020/2021 joint mock civic education multiple-choice test items comply with local item independence assumption?

Method
        In this study, an ex-post facto research design was used. This is because the test-takers scores from previously marked scripts were used, and this design was adopted. To avoid being test wised, all students in public Senior Secondary School (SSS) I, SSS II and SSS III in Kwara State were included in the study, while the target group was SSS II students who sat for joint mock in the 2020/2021 academic term. Permission was obtained from the Kwara State Ministry of Education and Human Capital Development to access the students' scripts that had already been marked and archived.
        At various phases of the selection process, a multistage sample procedure that included stratified, proportional, and simple random sampling techniques was used. To categorize schools based on the three senatorial districts, a stratified random sample technique was used in the first step. Kwara Central has 101 senior secondary schools, Kwara North has 82, and Kwara South has 163 schools as of the time of this study (Kwara State Ministry of Education and Human Capital Development, 2021). A simple random sample technique was used in the second stage to choose 8 schools from Kwara Central, 4 schools from the North, and 12 schools from the South. Multiple-choice civic questions are already marked at the third level. To interpret the tetrachoric correlation coefficients obtained in the output, the thumb rule was used. According to Christensen, Makransky, & Horton (2017), the rule of thumb can be used in a number of ways. They stated that there is no agreement on the implementation of thumb rules. For instance, Marais and Andrich (2008a) proposed and used a coefficient value of 0.1 to investigate local item dependence. Chen & Thissen (1997) proposed a correlation residual of 0.2. For example, Hissbach, Klusmann, and Hampe (2011); Makransky &

Bilenberg (2014); Makransky, et., al, (2014); and Alade, et., al, (2020) utilized 0.2 in their studies. The third proposed rule of thumb is the 0.3 value, which has also been used by numerous scholars.

FINDINGS

It is necessary to consider and equate the latent variable (ability) of the examinees in the computation and interpretation of the finding as a preamble to answering the research question and as one of the steps in conducting local item independence. The Winngen 3.0.10.433 software was used to generate Theta (θ) for 3,137 test subjects, as shown in table 1.

Table 1: Theta (Ability) Generated for 3, 137 Test-takers

S/N	Theta	S/N	Theta	S/N	Theta	S/N	Theta	S/N	Theta
1	-0.50	40	-0.15	79	-0.36	118	0.13	157	1.10
2	0.94	41	-0.68	80	-0.18	119	0.59	158	0.20
3	-0.79	42	0.66	81	0.72	120	-0.84	159	-0.74
4	-0.57	43	-0.52	82	1.87	121	-0.28	160	-0.36
5	-1.34	44	-1.22	83	-1.44	122	0.46	161	-0.50
6	-1.06	45	0.02	84	0.15	123	-1.04	162	-1.19
7	0.77	46	2.43	85	-0.25	124	0.69	163	1.19
8	-0.36	47	1.34	86	1.37	125	0.38	164	-0.77
9	1.45	48	1.96	87	1.15	126	-1.48	165	-0.99
10	-1.77	49	-0.19	88	0.09	127	-1.57	166	0.41
11	1.20	50	-0.01	89	-0.30	128	0.31	167	0.93
12	-0.21	51	0.01	90	-0.52	129	-0.20	168	-1.98
13	0.66	52	0.34	91	0.34	130	1.30	169	-0.25
14	1.47	53	0.49	92	-0.79	131	1.61	170	-0.10
15	0.58	54	1.05	93	1.74	132	0.28	171	1.11
16	0.05	55	0.99	94	1.89	133	0.23	172	-1.01
17	1.88	56	-0.39	95	0.63	134	-0.52	173	-0.23
18	-0.31	57	-0.55	96	-1.26	135	-0.05	174	-1.38
19	1.43	58	0.05	97	-1.32	136	-1.36	175	1.15
20	1.67	59	-0.95	98	0.41	137	0.76	176	-1.66
21	0.78	60	0.04	99	-0.19	138	-0.26	177	-1.59
22	0.51	61	-1.38	100	0.39	139	-0.92	178	-1.38
23	-0.07	62	1.58	101	-1.42	140	-1.62	179	-0.63
24	1.36	63	0.68	102	1.22	141	1.62	180	-0.12
25	-0.37	64	0.16	103	-2.53	142	0.08	181	0.25
26	-3.25	65	0.34	104	-0.20	143	0.20	182	0.54
27	1.13	66	-0.03	105	0.57	144	-1.17	183	1.45

28	0.57	67	0.86	106	-0.21	145	0.84	184	-2.29
29	0.16	68	0.40	107	0.19	146	-0.68	185	0.06
30	0.01	69	-0.28	108	-1.27	147	0.63	186	0.70
31	-1.79	70	0.08	109	0.69	148	-0.73	187	-1.07
32	-0.01	71	-0.99	110	0.05	149	-0.10	188	-2.65
33	0.48	72	0.48	111	-1.86	150	-0.11	189	-0.58
34	1.54	73	0.13	112	-2.32	151	1.16	190	-1.56
35	1.23	74	1.04	113	1.26	152	0.64	+++	+++
36	-1.22	75	0.08	114	0.84	153	0.45	+++	+++
37	0.29	76	0.55	115	-0.66	154	-0.07	+++	+++
38	-0.07	77	0.34	116	-0.50	155	0.81	+++	+++
39	1.00	78	0.04	117	0.83	156	-0.35	3,137	1.34

Table 1. The latent variable (ability) of the test-takers sampled

These sets of data were compressed using a histogram to show the distribution of ability levels of the sampled students as demonstrated in figure 1.
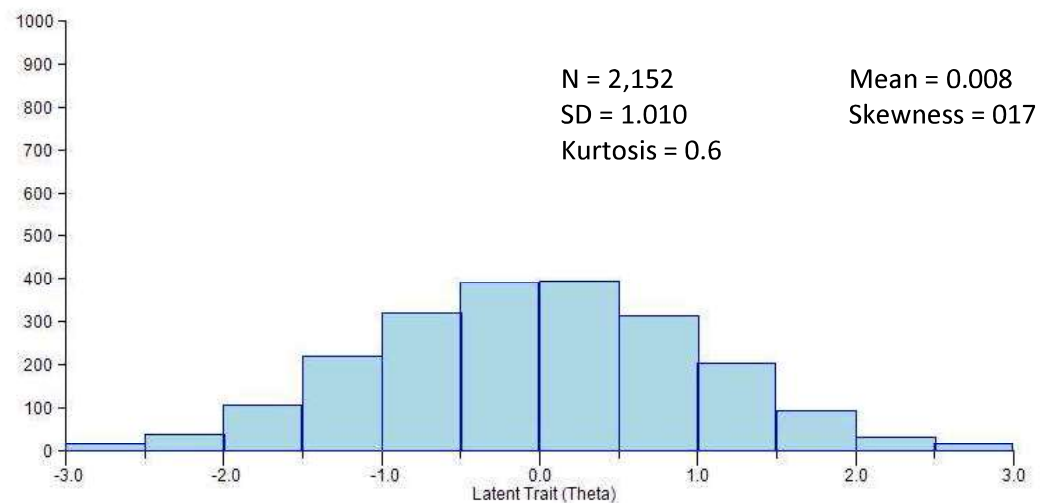

Figure 1: Sampled Test-takers Ability (Theta)

Figure 1 shows the cumulative test-takers latent trait. The ability level ranges from -3 to +3. From the graph, most of the abilities are concentrated between -2 to +2. This implies that the test-takers' latent traits are normally distributed and therefore fit the assumption model of this study. Having done this, the research question was answered.

Research Question: To what extent do the 2020/2021 joint mock civic education multiple-choice   test items comply with local item independence assumption?

Table 2: Tetrachoric Inter-items Correlation of Kwara State Joint Mock Binary Response Civic Education Test Items

Items	1	2	3	4	5	6	7	8	9	10	11	12	13	+++	+++	item 50
1	1															0.01
2	0.12	1														0.10
3	0.12	0.00	1													0.00
4	0.00	0.02	0.00	1												0.02
5	0.15	0.12	0.00	0.01	1											0.00
6	0.07	0.00	0.00	0.13	0.14	1										0.00
7	0.10	0.00	0.00	0.19	0.00	0.01	1									0.00
8	0.00	0.02	0.10	0.02	0.00	0.10	0.10	1								0.02
9	0.11	0.10	0.13	0.17	0.11	0.00	0.10	0.00	1							0.02
10	0.00	0.00	0.00	0.19	0.00	0.00	0.00	0.14	0.41**	1						0.00
11	0.10	0.02	0.16	0.10	0.00	0.11	0.00	0.00	0.01	0.00	1					0.00
12	0.13	0.12	0.00	0.15	0.00	0.12	0.10	0.00	0.00	0.02	0.11	1				0.00
13	1.11	0.04	0.00	0.10	0.12	0.00	0.00	0.12	0.00	0.00	0.01	0.01	1			0.02
+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	1		0.00
+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	1	0.10
Item 50	0.10	0.10	0.00	0.02	0.00	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.02	+++	+++	1

Table 2, shows the summary of tetrachoric correlation coefficients of inter items correlation carried out among 50 multiple-choice items of joint mock of civic education. All the output of the analysis cannot be shown in this table, however, reveals that there are 2,450 correlation coefficients summarized in table 3.

Table 3: Summary of Tetrachoric Correlation Coefficients

S/N	Correlation Coefficient	Frequency	Percentage (%)
1.	Approximately zero (0)	1,306	53.31
2.	0.10 – 0.29	714	29.14
3.	0.30 – 0.49	380	15.51
4.	0.50 – 0.99	00	0.00

5.	1.00	50	2.04
	Total	2,450	100.0

Table 3 shows that out of 2,450 correlation coefficients obtained, 2,020 (82.45%) in s/n 1 and 2, are below the thumb rule of 0.3. This, therefore, implies that the items in the instrument are locally independent. Further interpretations of the output shows that items 1 and 1; 2 and 2; 3 and 3, 4 and 4, 5 and 5 etc. are perfectly correlated having a coefficient value of 1.00 each. Other items such as 1 and 2; 1 and 3; 1 and 4 etc have various degrees of coefficients. However, items 9 and 10 (0.45), 9 and 17 (0.39), 10 and 28 (0.42), 17 and 28 (0.37), 21 and 36 (0.33) and lastly 36 and 38 (0.40) with their respective coefficients are not in favor of local item independent, and they are 6 paired items based on the thumb rule of 0.3 adopted.

Discussion

The finding revealed that 82.45% of 50 items civic education multiple-choice items are in favor of local independence. However, items 9 and 10, 9 and 17, 10 and 28, 17 and 28 were highly correlated with a high coefficient greater than 0.3, and were constructed from curriculum content of democracy while items 21 and 36 and lastly 36 and 38 were also highly correlated with high coefficient, were constructed from drug and drug abuse.

The finding agrees with Onuka (2011) who found that 2010 WASSCE Economics multiple-choice test items were locally independent carried out in Ajerorni-Ifelodun Local Government Area, Lagos State. It also agrees with Ubi, Umoinyang & Joshua's (2011) findings. They found that JAMB-UME Mathematics 2000 to 2003 met the assumptions of Item Response Theory (IRT) on local independence. Further still, the finding agrees with Busari & Busari (2020). They found that out of 44 items, 34 (77.3%) held Local Item Dependence, 7 (15.9%) were locally independent while 3 (6.8%) had weak local dependence. The finding disagrees with Alade, et., al, (2020) that assessed the dimensionality and local independence of the 2018 WASSCE mathematics multiple-choice in Lagos State, Nigeria. The finding showed that some items violated the assumption of local independence.

Conclusion

Based on the analysis and discussion of the findings, it was found that in 82.45% of the cases, a correct answer to one item didn't result in a correct answer to another. As an outcome, it can be concluded that the set of civic education multiple-choice questions developed by the Kwara State Ministry of Education and Human Capital Development and used for joint mock examinations for the academic session 2020/2021 are good since they

encourage local independence and can thus serve as a preparatory test item for external examinations.

Recommendations
To construct credible items that could stand the test of time, the following recommendations are put forward:
1.   Local item dependency should be taught as part of psychometric properties in undergraduate and   postgraduate programs.
2.   Local item independence is a form of psychometric properties, especially for multiple-choice   items. Test developers, examining bodies, psychometricians, and researchers should endeavour to   incorporate it into other forms of validity and reliability.
3.   Professionals in the field of test development should be recruited and have a department in the   Ministry of Education that could assist in the training and retraining of teachers on the general   principles of test development.
4.   Multiple-choice items that have been validated by experts in test and measurement, psychometricians, and other researchers could be banked for further use.

References
Alade, O. M., Aletan, S. & Sokenu, B. S. (2020). Assessing the dimensionality and local independence of WASSCE 2018 Mathematics objective tests scores in Lagos State, Nigeria. AJB-SDR, 2 (1), 8–16. https://www.abreap.org.
Anigbo, L. C. (2016). Factors Affecting Students' Interest in Mathematics in Secondary Schools in Enugu State. International Journal of Education and Evaluation, 2, (1), 22–28. https://www.iiardpub.org.
Ayanwale, M. A. (2017). Efficacy of Item Response Theory in score ranking and concurrent validity of dichotomous and polytomous response mathematics achievement test in Osun State, Nigeria. Unpublished Ph.D. Thesis. Institute of Education. University of Ibadan.
Brown, D. H. (2004). Language assessment: Principles and classroom practice. Longman.
Busari, Y. T. & Busari, K. S. (2020). Comparing local item dependency from inter-item correlation matrix and principal component analysis from factor analysis for the dimensionality of the multidimensional dataset.

International Journal of Scientific and Research Publications (IJSRP)·10, (7), 254–263. https://www.researchgate.net/publication/343496184.

Chen, W. H. & Thissen, D. (1997). Local dependence indexes for item pairs using item response theory. Journal of Educational and Behavioral Statistics, 22, 265-289.

Courville, T. G. (2004). An Empirical Comparison of Item Response Theory and Classical Test Theory Item/Person Statistics, Ph.D. Dissertation, Texas A & M University.

Identification of local dependence in the Rasch model using residual correlations. White Rose Research Online, 1–37.

Christensen, K. B., Makransky, G. & Horton, M. (2017). Top of FormCritical Values for Yen's Q3: Identification of Local Dependence in the Rasch Model Using Residual Correlations. Applied Psychological Measurement. 41(3), 178–194. Doi: 10.1177/0146621616677520.

Das Nair, R., Moreton, B. J., & Lincoln, N. B. (2011). Rasch analysis of the Nottingham extended activities of daily living scale. Journal of Rehabilitation Medicine, 43, 944–950.

Davidson, M., Keating, J. L., & Eyres, S. (2004). A low back-specific version of the SF-36 Physical Functioning Scale. Spine, 29, 586-594. 192 Applied Psychological Measurement 41(3).

De Ayala, R. J. (2010). The Theory and Practice of Item Response. Journal of Educational Measurement 47 (4). Available at https://onlinelibrary.wiley.com. https:/doi:10.1111/j.1745-3984.2010.

Debelak, R. & Koller, I. (2019). Testing the Local Independence Assumption of the Rasch Model with Q3-Based Nonparametric Model Tests. Applied Psychological Measurement, 1–15.

Embretson, S. E., & Reise, S. P. (2000). Item response theory for psychologists. Lawrence Erlbaum Associates.

The Federal Republic of Nigeria, (2014). National policy on education. (Reprinted 6th Ed.). NERDC Press.

Hissbach, J. C., Klusmann, D. & Hampe, W. (2011). Dimensionality and predictive validity of the HAMNat, a test of natural sciences for medical school admission. BMC Medical Education, 11, Article 83.

Hughes, A. (2003). Testing for the language teacher. Cambridge University Press.

Huynh, H. & Michaels, H. R. (1995). A comparison of three statistical procedures to identify. A paper was presented at the invited symposium "Technical advances in partial credit models and their applications to performance assessments" at the annual meeting of the National Council on Measurement in Education, San Francisco.

Ibrahim, A. (2017). The Influence of Item Response Parameters, Distracter Functioning andCorrect Response Location on the Difficulty Level of

Multiple-Choice Questions. Journal of Educational Studies, Institute of Education, University of Jos, Jos, Plateau State, Nigeria. 17(1), 490-504. https://www.researchgate.net/publication/322042556.

Kim, D., De Ayala, R., Ferdous, A. A., & Nering, M. (2011). The comparative performance of conditional independence indices. Applied Psychological Measurement, 35, 447-471.

Kotz, S. & Johnson, N. L. (2006). Encyclopedia of Statistical Science, (2nd ed). Wiley

Kwara State Ministry of Education and Human Capital Development (2021). Annual education sector Performance report.

La Porta, F., Franceschini, M., Caselli, S., Cavallini, P., Susassi, S., & Tennant, A. (2011). Unified balance scale: An activity-based, bed for the community, and an aetiology-independent measure of balance calibrated with Rasch analysis. Journal of Rehabilitation Medicine, 43, 435-444.

Makransky, G. & Bilenberg, N. (2014). Psychometric properties of the parent and teacher ADHD rating scale (ADHD-RS): Measurement invariance across gender, age, and informant. Assessment, 21, 694-705.

Moghadam, P. B. & Pishghadam, R. (2008). The effects of the violation of local independence assumption on the person measures under the Rasch model. IJAL, 11, (1), 51 – 67.

Monseur, C, Baye, A, Lafontaine, D, and Quittre, V. (2011). PISA test format assessment and the local independence assumption. Educational Testing Service and International Association for the Evaluation of Educational Achievement. Monograph Series: Issues and Methodologies in Large-Scale Assessments Volume 4, 131 – 153.

Musa, A. Bichi, A. A., Suleiman, A. H. (2021). Implementation of the Civic Education Curriculum or Effective Citizenship, Peace and National Unity in Nigeria. American Journal of Humanities and Social Science (AJHSS), Journal Online,14, 6–13. https://www.researchgate.net/publication/350 099042.

Nigerian Educational Research and Development Council (2013). 9-Year Basic Education Curriculum – Civic Education for upper basic education (SS 1-3). NERDC Press.

Olsbjerg, M, & Christensen, K. B. (2015). Modelling local dependence in longitudinal IRT models. Behavior Research Methods 47, 1413–1424.

Onuka, A. O. U. (2011). Item Local Independence in WAEC (SSCE) Economics in Ajerorni-Ifelodun Local Government Area, Lagos State. Ife Journal of Theory and Research in Education (IJOTRE) 13, (2), 105 -117.

Pourya, B. M. & Reza, P. (2008). The Effects of the Violation of Local Independence Assumption on the Person Measures under the Rasch Model. International Journal of Applied Logistic 11(1): 61-67

Ramp, M., Khan, F,Misajon, R. A. & Pallant, J. F. (2009). Rasch analysis of the Multiple Sclerosis Impact Scale (MSIS-29). Health and Quality of Life Outcomes, 7, article 58. http://www.hqlo.com/content/7/1/58. Doi:10.1186/1477-7525-7-58.

Røe, C., Damsgard, E., Fors, T., & Anke, A. (2014). Psychometric properties of the pain stages of change questionnaire as evaluated by Rasch analysis in patients with chronic musculoskeletal pain. BMC Musculoskeletal Disorders, 15, Article 95.

Sijtsma K., Molenaar, I. W. (2002). Introduction to nonparametric item response theory. Sage.

Ten Klooster, P. M., Taal, E, & van de Laar, M. A. F. J. (2008). Rasch analysis of the Dutch health assessment questionnaire disability and the Health Assessment Questionnaire II in patients with rheumatoid arthritis. Arthritis & Rheumatism, 59, 1721-1728.

The online Premium Times (November 2, 2020). Updated: 65.24% of WASSCE candidates scored five credits in Mathematics English Language and others, announced by Patrick Areghan, the Council's Head of National Office, Lagos.

Ubi, I. O., Umoinyang, I. E. & Joshua, M. T. (2011). Item local independence in selection examination in Nigeria. Education for Today, 7, (1).

Van den Wollenberg, A. L. (1982). Two new test statistics for the Rasch model. Psychometrika, 47, 123-139.

Wang, W. C., Cheng, Y. Y. & Wilson, M. (2005). Local item dependence for items across Tests are connected by common stimuli. Educational and Psychological Measurement, 65 (1), 5-27.

Ziegler, M. & Hagemann, D. (2015). Testing the Unidimensionality of Items: Pitfalls and Loopholes. European Journal of Psychological.