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Item Parameter Drifts Across School Type in Educational Psychology Examination for 2022

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ABSTRACT

The study assessed item parameter drifts across school type in institution's examination body for educational psychology examination for 2022. Two research questions guided the study and two hypotheses were tested. The study adopted a descriptive survey research design. The population consisted all the 6,742 first year students from the 9 public and 5 Government approved private universities that enrolled for 2022/2023 academic session. A sample of 820 educational psychology students from the 14 schools approved to study educational psychology were selected through multistage sampling. The 2022 educational psychology multiple choice examination questions were adapted as instruments for the study. The instrument did not pass through validation and reliability as they were already good questions used by WAEC. Bilog MG software was used to answer the research questions while Analysis of Variance (ANOVA) was used to test the null hypotheses at 0.05 level of significance. The findings of the study among others showed that in 2022, seven items were deemed to have drifted significantly among the examinees. Of these seven drifting items, the drift parameter was positive for six items, indicating they became more difficult for the subsequent group of examinees. The one remaining items that exhibited significant drift became easier for the subsequent group of examinees. The study recommended among others that institution examination bodies should ensure that as items are re-used or repeated, response parameter must be updated and made more accurate to stated criteria before use.

Keywords: Item Parameter Drift (IPD), School Type, and Educational Psychology

Introduction

Psychology is the study of mental processes and behaviors and the relationship between them. Mental processes include skills like learning, reasoning, emotion and motivation. To study psychology is to learn how humans and other organisms think, understand, learn, perceive, feel, act and interact with others. Because psychology encompasses human and social issues as well as biological and physiological ones, it is categorized as both a natural and social science. As natural, psychology is concern with laws of nature. As a social science, psychology involve the study of the laws of thought, feelings and behaviors of humans and other organisms (Owusu-Darko, Yaw, Hughes, & Florence, 2017). Over the years, educational psychology has made tremendous effect on education towards knowledge acquisition. Educational psychology according to Tuckman and Monettic (2011) is the science of human behavior applied to the teaching and learning process. Its purpose is to produce practical knowledge about educational setting and behavior. It helps teachers to produce practical knowledge about educational setting and behavior. The knowledge of educational psychology helps the teacher in several ways. These include understanding stages of development, knowing the learner, understanding the nature of classroom problem. Furthermore, it helps in developing necessary skills and interest in teaching, understand effective method of teaching, understand the relevance of hereditary and environment on the child among other, (Parankimalil as cited in Sam-Tagoe, 2017).

The application of psychology in education therefore gives a means of praising individual students‟ similarities and differences and should enable the creation of more efficient learning environment for them. It provides a means of evaluating the strengths and weakness as learners and teachers and is a useful background for anyone concerned with the young. One reality of teaching is that many events occur simultaneously and in rapid fire succession. Events happen quickly and it is difficult to predict what effect any one by the teacher will have on any particular students. Often teachers must make quick decisions that have uncertain outcomes. The complexities of classroom do not allow effective teachers to follow a ‟one size fit all‟ approach to teaching. The teacher must master a variety of perspective and strategies and be flexible in their application. (SamTagoe, 2017). Educational psychology which covers the areas of child and adolescent development, social psychology, psychological testing and educational counseling when studied by the

teacher will equip him with the necessary knowledge, skills, attitudes and aptitudes in executing his delivery of lesson to improve the academic performance of students.

However one of the primary issues confronting tertiary institutions especially Nigeria is the inconsistency of student achievement in core subjects, particularly educational psychology. Over the years, there has consistently been a sharp difference in the achievement of students in educational psychology examination. Based on Educational Psychology Examiners Reports (2023), there was a recurrence of Nnamdi Azikiwe University, Awka students' unstable achievement in educational psychology examination. Candidates achievement in educational psychology in Nnamdi Azikiwe University, Awka for 2011 (38.93%), 2012 (49%) and 2015 (34.18%) examination significantly differed from those of later years 2013 (36%) and 2014 (31.30%). Same unstable performance was experienced in 2018 (48.15%) and 2019 (64.18%) where there was marked variation in the achievement of students between the years in the aforementioned examination in educational psychology. Several factors among which are school location, school type, gender, study habit among others are accountable for the poor achievement of students in educational psychology (Akomolufe and Olorunfemi-Olabisi 2011). The educational psychology achievement of tertiary education students is undermining Nigeria's goal for technological growth and economic liberation. There has always been a noticeable disparity in achievement between students of different school type.

School type is a vital variable in the school system. It refers to the classification of schools based on factors such as educational approach, curriculum among many others. Examples of school type include public schools, private schools, charter schools, Montessori schools and others. This study will be using private and public school types. Public schools are owned and funded by Federal and/or State Government as opposed to private schools that are owned and funded by individual(s) or organizations. Whether a school is considered public or private depends on the country and its specific education landscape.

There is a widely-held view that students who attend private schools perform better than those who attend public schools in different parts of the world (Eniayewu, 2015). More so, Nwazuzu as cited by Eniayewu (2015), observed a significant gap in students' achievement in Public and Private Institutions. The difference in educational psychology academic achievement could be a function of the quality of items developed by the school examination body.

In Nigeria, these examination bodies construct and administer test items on various courses offered by tertiary institution students for the purpose of certification. Students that take these examinations are expected to record a consistent achievement between test administrations without bias to discipline, location, and school type. However, candidates who participate in the examination conducted by these examination bodies are in different social and cultural settings and therefore differently toned for personal and environmental reasons (Bandele and Aborisade, 2018). More so, there is the likelihood of repeating items over test administrations. Consequently, the issue of item parameter drift can hardly be ruled out in this examination.

Item parameters are some of the indices estimated when a test is analyzed under item response theory. Item parameters are statistical indicators that define the quality of an item in the instrument employed (Orheruata in Oguguo and Lotobi, 2019). These item parameters include item difficulty, item discrimination and item distractor. This research work focused on item difficulty and item discrimination. Item difficulty is an index which indicates how easy or difficult an item is as an item should neither be too easy nor too difficult. Item discrimination is the ability of an item to differentiate among students on the basis of how well they know the material being tested. It is a measure of how well an item is able to distinguish between examinees who are knowledgeable and those who are not (Okoye, 2015). Distractors are one of the key components that affect the overall quality of multiple-choice items as well as the items' statistical characteristics (Gierl et al, 2017). Distractors are used to differentiate between students who do not have the essential knowledge to correctly answer the item and those who do. A well developed test/ examination needs to have its' item parameters at a level where across the years students/examinees will not say there was a year more difficult or easier questions were presented than the other as this may bring about item parameter drift.

Item Parameter Drift (IPD) is a situation in which the difficulty and discrimination indices of an item or items vary over multiple administrations of a test to a certain population. In generic terms, deviations in item parameters from the true value to its successive testing administrations are known as item parameter drift (Wells et al., 2014). Item parameter drift (IPD) is a phenomenon where changes in the statistical properties (difficulty and discrimination) of a test in various testing occasions are different (Akande, 2015). In the event of this occurrence, items can be considered easier or less discriminating than their true estimates.

Statement of the Problem

Over the years, the reports from the Chief Examiners indicate that the achievement in educational psychology by examinees has been experiencing an unstable trend as some years it is good and for others it is not. This is evidenced by statistics shown by the Chief Examiners' Reports in candidates achievement in educational psychology for 2011, 2012 and 2015 examination significantly differed from those of later years (2013, 2014) as there was improvement when compared (2013, 2014). Same trend was experienced in 2018 (48.15% pass) and 2019 (64.18% pass) respectively where there is marked variation in the achievement of students between the years in the aforementioned examination in educational psychology some researchers asserted that there was a decrease in students' academic achievement in educational psychology over time. The issue of average to poor achievements may not only be attributed to teaching methods, instructional materials, teachers' characteristics among others. Several factors such as item parameters drifting, school type and location have been identified as been at the core of students' inconsistent achievement in educational psychology over the years. Could it be that the items constructed and eventually administered by the examination bodies over the years drifted along the parameters of difficulty and discrimination lines? Is the achievement of examinees good or bad because of the parameters of the item used?

Examinees that have similar knowledge of the material are expected to perform similarly on individual test items over test administrations, regardless of school type. More often than not, subsequent examinees tend to perform better than their previous counterparts as a result of taking the pedagogical implications of the test items for granted which may have caused the drift in item parameter. As a result of this inconsistent achievement among examinees, the researcher deemed it fit to investigate school type on item parameter drift of mathematics objective examination constructed by the institution's examination body for 2022.

Research Questions

The following formulated research questions guide the study:

1. What is the drift in the distributions of item difficulty indices of 2022 the institution's examination body for educational psychology multiple-choice tests based on school type?
2. What is the drift in the distributions of item discrimination indices of 2022 institution's examination body for educational psychology multiple-choice tests based on school type?

Hypotheses

The following hypotheses were tested at 0.05 level of significance.

1. The drift in the item difficulty indices of 2022 institution's examination body for educational psychology multiple-choice tests does not depend significantly on the school type.
2. The drift in the item discrimination indices of 2022 institution's examination body for educational psychology multiple-choice tests does not depend significantly on the school type.

Methods and Materials

The study adopted a descriptive survey research design. The population consisted all the 6,742 first year students from the 9 public and 5 Government approved private universities that enrolled for 2022/2023 academic session. A sample of 820 educational psychology students from the 14 schools approved to study educational psychology were selected through multistage sampling. The 2022 educational psychology multiple choice examination questions were adapted as instruments for the study. The instruments did not pass through validation and reliability as they were already good questions used by examination bodies of these institutions. Bilog MG software was used to answer the research questions while Analysis of Variance (ANOVA) was used to test the null hypotheses at 0.05 level of significance.

Results

The two basic assumptions of item response theory- dimensionality and local independence were examined. In terms of dimensionality, DIMTEST statistics was used in this study while local independence assumption of item response theory was investigating based on Yen's Q3, residuals for any pair of items. Two parameters model was used in calibration of item parameter drifts since the focus of the difficulty and discrimination as stated in the purpose of the study.

Table 1: Dimtest Statistics of 2022 Educational Psychology Multiple Choice Test Items

Year	TL	TGbar	T	P-value
2020	18.6778	5.1178	11.5456	0.0022

The result in table 3 indicates that 2020 educational psychology multiple choice test items is multidimensional since p- <.05 level of significance

Local independence assumption of item response theory was investigated based on Yen's Q3, residuals for any pair of items should be uncorrelated, and generally close to zero. Residual correlations that are high indicate a violation of the local independence assumption (Marais, 2013). For this study, using Yen's Q3 to screen items for local dependence, most items residual correlations were below absolute value of .2 for the Q3 statistic itself was found for the period under review. This indicates that the assumption local independence of item response theory was not grossly violated.

Research Question 1: What is the drift in the distributions of item difficulty indices of 2022 institution's examination body for educational psychology multiple-choice tests based on school type?

The results of drift parameter and drift test of item difficulty indices of 2022 educational psychology multiple-choice tests based on school type was present in table 2.

Table 2: Drift Parameter and Drift Test of Item Difficulty Indices of 2022 Institution's Examination Body for Educational Psychology Multiple-Choice Tests Based on School Type

Item	Private	Public	Drift Parameter	Drift test	Item	Private	Public	Drift Parameter	Drift test
1	14.684	6.792	-12.108	**-6.874**	26	1.577	-0.088	1.665	0.182
2	8.477	-9.089	17.566	0.962	27	-0.769	-1.544	0.775	**2.138**
3	-4.648	-4.699	0.051	0.103	28	-0.578	-0.910	0.332	0.117
4	0.511	0.138	0.373	0.119	29	-0.084	-0.133	0.049	0.103
5	-1.108	-0.440	-0.668	0.068	30	-0.100	-0.296	0.196	**2.110**
6	0.395	-0.683	1.078	0.153	31	-0.048	-0.643	0.595	0.130
7	-2.102	-3.428	1.326	0.165	32	0.009	-0.475	0.484	**2.124**
8	0.601	-0.314	0.915	0.145	33	-0.481	-0.448	-0.033	0.099
9	0.055	-0.269	0.324	0.116	34	0.584	-0.218	0.802	0.140
10	-0.510	-0.385	-0.125	0.094	35	-0.004	-0.256	0.252	**2.113**
11	-1.147	-0.527	-0.620	0.070	36	0.526	-0.503	1.029	0.151
12	-0.590	-0.668	0.078	0.104	37	-0.442	-0.598	0.156	0.108
13	-0.453	-0.060	-0.393	0.081	38	-0.026	-0.683	0.657	0.133
14	-5.373	-3.842	-1.531	0.025	39	0.491	-0.274	0.765	**3.138**
15	-0.741	-0.139	-0.602	0.071	40	0.465	-0.152	0.617	0.131
16	-0.352	-0.127	-0.225	0.089	41	-0.113	-0.891	0.778	0.139
17	-1.430	-1.419	-0.011	0.100	42	0.518	0.348	0.170	0.109
18	0.774	0.300	0.474	0.124	43	-0.529	-0.289	-0.240	0.089
19	-0.197	-0.317	0.120	0.106	44	0.840	0.236	0.604	0.130
20	0.375	-0.086	0.461	0.123	45	-0.578	-1.773	1.195	0.159
21	-0.666	-1.252	0.586	0.129	46	0.324	-0.258	0.582	**2.129**
22	-0.219	-0.261	0.042	0.102	47	-0.482	-0.497	0.015	0.101
23	0.837	-4.118	4.955	0.344	48	0.003	-0.312	0.315	0.116
24	-0.300	-1.926	1.626	0.180	49	0.320	-1.001	1.321	0.165
25	-0.248	-0.448	0.200	0.110	50	0.391	-0.401	0.792	0.139

Bold items statistically significant (Drift test is greater than 1.96)

Table 2 shows that among the 50 items in 2022 seven items were deemed to have drifted significantly for among the examinees. Of these seven drifting items, the drift parameter was positive for six items, indicating they became more difficult for the subsequent group of examinees. The one remaining items that exhibited significant drift became easier.

Research Question 2: What is the drift in the distributions of item discrimination indices of 2022 institution's examination body for educational psychology multiple-choice tests based on school type?

The results of drift parameter and drift test in the distributions of item discrimination indices of 2022 institution's examination body for educational psychology multiple-choice tests based on school type were present in table 3.

Table 3: Drift Parameter and Drift Test of Item Discrimination Indices of 2022 Institution's Examination Body for Educational Psychology Multiple-Choice Tests Based on School Type

Item	Private	Public	Drift Parameter	Drift test	Item	Private	Public	Drift Parameter	Drift test
1	-0.077	-0.012	-0.065	0.213	26	0.561	0.677	-0.116	**4.049**
2	-0.066	0.176	-0.242	-0.356	27	0.332	0.607	-0.275	-0.462
3	0.303	0.317	-0.014	0.377	28	1.075	0.765	0.310	1.419
4	0.539	1.055	-0.516	-1.237	29	0.847	0.943	-0.096	0.113
5	0.570	0.713	-0.143	-0.038	30	0.931	0.974	-0.043	0.284
6	0.888	0.322	0.566	**2.242**	31	1.403	1.254	0.149	0.901
7	0.199	1.036	-0.837	**-2.269**	32	0.811	1.109	-0.298	**5.536**
8	0.404	1.066	-0.662	-1.707	33	0.913	0.992	-0.079	0.168
9	0.908	1.359	-0.451	-1.028	34	0.811	0.815	-0.004	0.409
10	0.836	1.349	-0.513	-1.227	35	1.293	1.223	0.070	0.647
11	0.831	0.951	-0.120	**4.036**	36	0.614	1.016	-0.402	-0.871
12	0.719	0.850	-0.131	0.001	37	1.122	0.604	0.518	**2.088**
13	0.694	0.690	0.004	0.435	38	0.722	0.926	-0.204	-0.234
14	0.254	0.277	-0.023	0.348	39	0.666	1.222	-0.556	-1.366
15	1.330	1.116	0.214	**2.110**	40	1.216	0.702	0.514	**2.075**
16	0.738	0.693	0.045	0.567	41	0.823	1.035	-0.212	-0.260
17	0.703	0.679	0.024	0.499	42	0.570	0.819	-0.249	-0.379
18	0.238	0.396	-0.158	-0.086	43	0.795	1.243	-0.448	-1.018
19	0.685	0.726	-0.041	0.290	44	0.775	0.739	0.036	0.538
20	0.709	0.694	0.015	0.470	45	0.728	0.625	0.103	0.753
21	0.320	0.533	-0.213	-0.263	46	0.729	1.366	-0.637	-1.626
22	0.934	1.053	-0.119	0.039	47	1.214	1.035	0.179	0.998
23	0.170	0.283	-0.113	0.059	48	0.581	1.471	-0.890	**-2.440**
24	0.452	0.516	-0.064	**3.216**	49	0.740	0.553	0.187	1.023
25	0.846	0.995	-0.149	-0.057	50	0.638	1.052	-0.414	**-4.909**

Bold items statistically significant (Drift Statistics is greater than 1.96)

Table 3 shows that among the 50 items in 2020, eleven items were deemed to have drifted significantly among the examinees. Of these eleven drifting items, the drift parameter was positive for seven items, indicating they became more difficult for the subsequent group of examinees. The four remaining items that exhibited significant drift became easier.

Hypothesis 1: The drift in the item difficulty indices of 2022 institution's examination body for educational psychology multiple-choice tests does not depend significantly on the school type.

Table 4: ANOVA Test of Item Difficulty Drift Based on School Type

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	214.900	2	107.450	3.725	.026
Within Groups	4240.397	147	28.846		
Total	4455.297	149			

Table 4: Multiple Comparisons

					95% Confidence Interval	
(I) Group	**(J) Group**	**Mean Difference (I-J)**	**Std. Error**	**Sig.**	**Lower Bound**	**Upper Bound**
2020		-.584320	1.074174	.850	-3.12763	1.95899

*. The mean difference is significant at the .05 level.

Table 4 shows that the drift in the item difficulty indices of 2022 institution's examination body for educational psychology multiple-choice tests is significantly different based on the school type ((F(2,149) = 3.725; p <.05). A post Hoc comparison shows that there is different between drift in the item difficulty indices of 2022 institution's examination body for educational psychology multiple-choice tests is significantly different (M=2.78, SE=1.07, p<.05).

Hypothesis 2: The drift in the item discrimination indices of 2020 WAEC educational psychology multiple-choice tests do not depend significantly on the school type.

Table 5: ANOVA Test of Item Discrimination Drift Based on School Type for 2020

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	98.646	2	49.323	1.512	.224
Within Groups	4795.223	147	32.621		
Total	4893.869	149			

Table 5 shows that the drift in the item difficulty indices of 2022 institution's examination body for educational psychology multiple-choice tests is not significantly different based on the school type(F(2,149) = 1.512; p > .05).

Discussion of Findings

Drift in the Distributions of Item Difficulty Indices of 2020 Institution's Examination Body for Educational Psychology Multiple-Choice Tests Based on School Type

The findings of the study revealed that in 2022, seven items were deemed to have drifted significantly among the examinees. Of these seven drifting items, the drift parameter was positive for six items, indicating that they became more difficult for the subsequent group of examinees. The one remaining item that exhibited significant drift became easier. Corresponding hypothesis shows that the drift in the item difficulty indices of 2022 institution's examination body for educational psychology multiple-choice tests is not significantly different based on the school type. A post Hoc comparison shows that there is difference between drift in the item difficulty indices of 2022 institution's examination body for educational psychology multiple-choice tests is significantly different from zero. The above finding is in line with Krause (2012) study that some items examined drifted significantly and became easier, consistent with item exposure. Furthermore, Oguguo and Lotobi (2019) study on three consecutive years of past questions in educational psychology across sampled private and public schools found out that item parameter drift with respect to item difficulty and item distractors-aspects of item parameter.

Drift in the Distributions of Item Discrimination Indices of 2022 Institution's Examination Body for Educational Psychology Multiple-Choice Tests Based on School Type

The researchers also found out from the findings that eleven items were deemed to have drifted significantly for 2022 examination among the examinees. Of these eleven drifting items, the drift parameter was positive for seven items, indicating that they became more difficult for the subsequent group of examinees. The four remaining items that exhibited significant drift became easier. Corresponding hypothesis shows that drift in the item discrimination indices of 2022 institution's examination body for educational psychology multiple-choice tests is not significantly different based on the school type. The study is in agreement with that of Lee and Geisinger (2018) reported that items used in most examination drifted significantly and became easier, consistent with item exposure. This was also supported with Krause (2012) study that some items examined drifted significantly and

became easier, consistent with item exposure. Furthermore, Wu et al (2006) (2019) study on educational psychology across sampled urban and rural schools found out that item parameter drift with respect to item difficulty and item distractors-aspects of item parameter.

Conclusion

There was some evidence that some of the items in the 2022 educational psychology examination drifted and became easier over time, consistent with the behavior of exposed items.

Recommendations

The researcher wishes to recommends the following for further studies:

1. Items identifying as displaying parameter drift could be targeted for review by content experts. Items could be kept or discarded from the item pool based on the judgment of the content specialists and test developers. Each examination bodies has policies in place that specified that items should be discarded should be discarded when certain amount of parameter drift is identified
2. It is advisable for examination bodies to periodically determine parameter drift of their examination items in order to drastically reduce drift especially if drift is unidirectional. Also, sources of drift should be considered and addressed to possibly block future occurrence.
3. Institutions' examination bodies should ensure that as items are re-used or repeated, response parameter must be updated and made more accurate to stated criteria before use.
4. To ensure continuous quality, the calibrated items could be recalibrated with modern techniques such as item response theory to ensure that the items when reused are valid, reliable and interpretable.

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