Psychometric Evaluation of Teacher Educators' Ethical Conduct Self-Assessment Test Scale for Adoption in Northwest Nigerian Colleges of Education

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ABSTRACT

Ethical practices are essential in teacher education, just as education is crucial for a nation. Historically, teachers have been viewed as role models in society. This paper aims to enhance understanding of the ethical behavior of teacher educators in Nigerian Colleges of Education through a self-assessment test. The items for this test were created by the researchers and validated by six experts, achieving good content validity indices (I-CVI) and scale CVI (S-CVI) scores (0.80 – 0.96) using both universal agreement (S-CVI/UA) and average CVI (S-CVI/Ave) methods. The researchers conducted a pilot test with 25 items administered to 37 teacher educators at the College of Education in Sokoto, Nigeria. The psychometric properties of the ethical scale were then analyzed using the Rasch Model with Winsteps version 3.72.3, focusing on reliability, polarity, unidimensionality, and item difficulty. The results showed a Cronbach Alpha (α) reliability (KR-20) of 0.87, person reliability of 0.81, and a separation index of 2.07. Item reliability was 0.80 with a separation index of 2.03. While many items showed strong validity and reliability, some did not fit well, indicating a need for refinement or removal before broader implementation. Specifically, items that did not meet the acceptable criteria for fit and reliability were identified for modification, and some were discarded.

Keywords: Teacher educators, Colleges of Education, Ethical conduct, Self-Assessment, and Validation.

INTRODUCTION

Education is important to the social, economic and political development of a nation (FRN, 2013; FRN, 2014. Teacher educators train and raise teachers who are expected to be knowledgeable and effective in character in Nigeria (TRCN FRN, 2013). This calls for self-assessment of their ethical conduct to determine whether they influence the trainees positively or deter their moral development (Amani et al., 2022). In teacher education, ethical principles in classroom instructions and assessment practices is one of the main responsibilities of the teachers. The primary art of teaching deals with instruction, guidance, assessment and evaluation which tends to establish relationship between teacher and students, parents, head of school, employer and the society in general (Safder & Hussain Ch, 2018).

The word ethical is derived from ethics (Daniel & Sapo, 2020; Sadapotto et al., 2022). Ethics is the science of conduct which deals with actions of human beings as to their rightness or wrongness TRCN FRN, 2013). The word "ethics" is derived from the Greek word ethos, which means "character" (Bartneck et al., 2021; Gupta, n.d.). It is the word that refers to morals, values, and beliefs of the individuals, family or the society. Professional ethics is a set of moral standards that depict the professional conduct that is expected in all fields of human endeavour (Jss Göçer & Özğan, 2018; Khormaei, 2016). It explores the obligations of individuals within the perspective of their professional lives based on their responsibilities. Thus, it is expected that the teacher, whose role in society is vital, needs to be aware of his obligation to enhance a conducive learning environment, leading to the formulation of the code of conduct for the teaching profession (Vem et al., 2022).

An Overview of Ethical Code of Conduct for teachers around the Globe

A professional code of ethics sets a standard for each employee to balance the aims and the means employed to accomplish them to act in a manner that protects the public's well-being. Lack of guidance in teacher training

leaves trainees unequipped to instill values in students of other levels of education. Beside this, the moral values are principles or virtues such as honesty, integrity, truthfulness, compassion, helpfulness, love, respectfulness, hard work standards to discern right from wrong. They are beliefs held by individuals that guide the opinions one follows. Not one learner is a born criminal or a spoilt person, but the value placed on issues of the environment such as school or family cause deviation from the right path or societal moral standards (Kaur, 2019).

Tirri and Kuusisto, (2022) argue that teachers' professional ethics are not governed by a single, all-encompassing ethical framework covering all aspects of their profession. The best-known theories in moral philosophy are strongly normative and take a clear stand on the values behind right thinking and action. Most of these theories provide some universal principle that can guide the teacher to reach the morally right decision (Tirri and Kuusisto, 2022). They further confirm teaching ethics as: Responsibility, justice, care, truthfulness and commitment. Gurumoorthy Poobalan, et tal., (2023), opine equality, openness, secrecy, loyalty, perseverance, and avoidance conflicts of interest as the basic ethics in teaching profession. in addition, Personal and professional integrity, fairness in learning, honesty, transparency, conflict management, professional responsibility, and respect for diversity are the key elements analyzed (Damia & Maharani, 2023). The Ontario College of Teachers believes that the ethical standards for educators include the following principles:

1. Care: This standard emphasizes compassion, acceptance, interest, and insight in nurturing students' potential. Educators demonstrate their dedication to students' well-being and learning through positive influence, professional judgment, and empathy.

2. Trust: This standard focuses on fairness, openness, and honesty. Professional relationships among educators, students, colleagues, parents, guardians, and the community are built on trust.

3. Respect: Central to this standard are trust and fairness. Educators honor human dignity, emotional well-being, and cognitive growth. They model respect for spiritual and cultural values, social justice, confidentiality, freedom, democracy, and the environment in their professional conduct.

4. Integrity: This standard encompasses honesty, reliability, and moral action. Ongoing reflection helps educators maintain integrity in their professional duties and commitments.

Teachers should prioritize integrity in their professional responsibilities and actions, demonstrating persistence, accountability, cooperation, loyalty, respect for human dignity, a commitment to equality, and the avoidance of conflicts (Halder, 2024). Gurtu, (2019), stresses three types of obligations as the basic areas of ethical practices in teaching such as: obligations towards Students, Obligations towards Society, Obligations towards the Profession faced by the teacher in teacher education. Saxena and Upadhyay, (2020) on their part argue that code of ethics in teacher education should include: loyalty, collegiality, truthfulness, integrity and to be role models as well as exhibiting impartiality and morality in the classroom with parents and co-workers. To Udoy Chowdhury and Chowdhury, (2024), what the teachers need as ethical conduct are confidentiality and loyalty.

According to Gupta (2022), the National Council for Teacher Education (NCTE) mandates that ethical teachers demonstrate ethical practices in their responsibilities towards students, which include ensuring student safety, commitment to the teaching profession, collaboration with fellow educators, maintaining positive relationships with parents and community members, dedication to their duties, and promoting professional growth (pp. 5).

Research emphasizes the necessity for thorough test development and validation processes (Talip, 2019). Although the significance of ethical behavior among teacher educators is increasing, there is a lack of studies investigating the psychometric properties of the TEDSAT scale, particularly regarding its unique constructs. Previous research by Kisiel (2018), Korthagen & Vasalos (2005), and Yan (2019) have not utilized Rasch analysis to assess the measurement properties of ethical conduct among teacher educators in Nigerian Colleges

of Education. Furthermore, existing studies, such as those by Salleh (2017) and Kisiel (2018), have primarily focused on student populations, creating a gap in understanding the ethical behavior of teacher educators.

Teachers are expected to exemplify good character for their students, embodying desirable traits such as perseverance, honesty, integrity, compassion, respect, lawfulness, patience, fairness, responsibility, and unity (FRN, 2008; TRCN FRN, 2013). Professionals with a strong work ethic have internalized moral principles that guide their conduct and attitude towards work (Vem et al., 2022). The code of ethics for teachers in Nigeria is based on the codes of conduct recommended by the United Nations Educational, Scientific and Cultural Organization (UNESCO) (TRCN FRN, 2013). The code of conduct for teachers in Nigeria stipulates that assessments should be conducted objectively and that there should be a right to appeal against such assessments, as noted by Naim et al. (2016).

Collaboration among educators, teacher trainees, and the relationship between educators and parents should be guided by a code of conduct. Educators must strive to maintain high professional standards and show loyalty to professional organizations, such as the Colleges of Education Academic Staff Union (COASU), to foster a positive work environment. Additionally, teacher educators must refrain from negatively influencing students, as it is essential for them to honor their contractual obligations to uphold the rule of law and to protect the integrity of the teaching profession (FRN, 2013).

The ethical code of conduct for Nigerian teacher educators includes several key principles:

1. Obligation: This refers to the duty and commitment to uphold ethical principles and fulfill professional responsibilities (TRCN FRN, 2013). Teacher educators have a moral duty to act in the best interests of their students, colleagues, and the profession, promoting equity, justice, and fairness in their work (Daramola et al., 2022; Gupta, 2014).

2. Integrity: Integrity involves honesty, consistency, and moral uprightness in both words and actions (Gurtu, 2019). Teacher educators who exhibit integrity adhere to ethical standards, avoid conflicts of interest, and maintain transparency and accountability in their interactions with students, colleagues, and stakeholders (Gupta, 2014).

3. Law-abiding: Being law-abiding means complying with legal requirements, regulations, and professional standards that govern teacher education (Ndegwa & Khamah, 2018). Teacher educators are required to follow ethical guidelines, institutional policies, and legal mandates to ensure the safety, well-being as well as rights of their students and colleagues (Ndegwa & Khamah, 2018).

4. Role Modeling: Role modeling refers to the practice of exemplifying ethical values, behaviors, and professional standards that others can follow (Aduwa, 2021). Teacher educators who act as ethical role models inspire their students to maintain high levels of conduct and professionalism in their future careers (Aduwa, 2021).

5. Compassion: Compassion involves showing empathy, understanding, and concern for the needs and well-being of others (Ekwueme et al., 2016). Teacher educators who exhibit compassion foster supportive and nurturing learning environments that enhance student well-being, resilience, and academic achievement (Shava et al., 2021; Boyi, 2013; Vem et al., 2022).

Table 1. Review of Ethical Code dimensions in Nigeria for teachers

Author	Nigerian Ethical Conduct Dimention				
	Obligation	Integrity	Law-abiding	Role model	Compassion
TRCN FRN, 2013	X	X	X	X	X
(Sultana, 2014		X	X		

Gurtu, 2019	X				
Caine, 2019					X
Labbani, 2016	X	X			
(Njoku, 2020		X			
Kadri & Olanike, n.d		X			X
(FRN, 1999		X	X		

Ethical conduct is essential for maintaining the integrity, credibility, and trustworthiness of teacher education programs (Gupta, 2014; Gurtu, 2019). Teacher educators who exhibit ethical behaviour contribute to the professional development, moral growth, and ethical sensitivity of their students, preparing them to meet the ethical challenges and responsibilities of the teaching profession including the area of assessment (Shava et al., 2021).

LITERATURE REVIEW

The evaluation of university students often involves unethical practices, leaving students uncertain about whether to adhere to the ethical principles they have learned or to follow their instructors' methods (Kumolohadi et al., 2021). Therefore, raising awareness is crucial, self-assessment encourages individuals to reflect on their ethical practices, identifying their strengths and weaknesses while setting goals for improvement (Anh et al., 2023). Research indicates that self-assessment is a valuable formative assessment tool for teachers, fostering their development as independent and lifelong socialization agents (Seden et al., 2023). It helps educators examine their own adherence to ethical standards and is well-suited for implementing a code of conduct (Khoiriyah et al., 2015). Self-assessment is essential for self-regulated learning aimed at improvement, which is likely to draw researchers' attention to the development and validation of instruments for accurately measuring latent traits (Mendoza & Yan, 2021).

There are limited self-assessment tools addressing educators' ethical conduct (Khoiriyah et al., 2015). The authors argue that these tools should encompass various domains rather than solely focusing on cognitive aspects (knowledge acquisition). While self-assessment has been utilized by teachers for a long time to evaluate students' cognitive and psychomotor skills (León et al., 2021), it is less frequently applied to assess teachers' compliance with ethical standards. The literature indicates that self-assessment is fundamentally a part of formative assessment, aimed at enhancing learning outcomes as participants evaluate their own cognitive, psychomotor, and affective dimensions (Remesal and Estrada, 2023).Similarly, it is observed that there is lack of standardized instruments that can be referred to or use to measure teacher educators in the affective domain that are valid and reliable (Abdurrahmansyah et al., 2022; Erawati et al., 2021; Fauzani et al., 2021. Many researchers have developed their own tools to assess educators' competencies, but none have specifically addressed the different aspects of ethical behavior in this study due to cultural sensitivity (Amani et al., 2022.

Psychometric Properties in Rasch Model Analysis

Rasch models are increasingly utilized to analyze the psychometric properties of measurement tools across various fields, including health and psychological sciences, as well as education (Bond and Fox, 2007). These models help identify measurement issues that traditional validation techniques, such as factor analysis and Cronbach's alpha, might miss (Müller, 2020). This is achieved through rigorous testing, as the Rasch model operates on specific assumptions regarding the item response process (Boone, 2016; Boone et al., 2014). Rasch analysis involves examining and quantifying aspects such as accuracy, precision, reliability, construct validity, quality-control fit statistics, statistical information, and unidimensionality (Linacre, 2005). The purpose of this study is to explore the psychometric properties of the Ethical Conduct Self-Assessment Test for teacher educators using the Rasch model.

The psychometric properties of the instrument were evaluated using the Rasch measurement model. A total of 25 items were assessed for item reliability through the reliability index and separation index, focusing on five constructs, item polarity, and unidimensionality. Items that did not fit the model were revised or removed, while those that aligned with and enhanced the psychometric properties of the instrument were retained, following the guidelines of Linacre (2007) and Bond and Fox (2007).

Item Reliability

The reliability test of instruments in each questionnaire needs to be conducted to test the stability, consistency and consistent level of items with each other (Siew et al., 2019). An instrument must have a high degree of reliability, with the use of exact measurement tool. The instrument has no reliability if the researcher obtains a different score when the test had been done at different times while the conditions and requirements are the same (Yasin et al., 2018)

Table 2. Summary of item validity and reliability using Rasch Model

Criteria	Statistical information	Results
Item Validity	a. Item Polarity	PTMEA CORR > 0 (Bond & Fox 2007)
Item Fit	b. Item Fit	Total Mean Square infit and outfit of 0.6 – 1.4 (Bond & Fox 2007)
Item Misfit	c. Separation (SE)	All items show ≥ 2.0 (Linacre 2007)
Person Reliability	d. Person Reliability	Value > 0.8 (Bond & Fox 2007)
Item Reliability	e. Item Reliability	Value > 0.8 (Bond & Fox 2007)

Adopted from (Krishnan & Idris, 2014; Yasin et al., 2015).

Item Polarity

Items Polarity is intended to test the extent of construct to achieve its goals and the relationship among the items that are built with the respondents. This determines whether the item that you want to measure the constructs measured, the value (Bond, & Fox, 2015).

Table 3. Fit Indices for Item Fit

Statistics	Fit Indices
Outfit mean square values (MNSQ)	0.6 and 1.4 (Bond and Fox 2007) or 0.50 – 1.50 (Boone et al. 2014).
Outfit z-standardized values (ZSTD)	-2.00 – 2.00 (Bond and Fox 2007; Boone et al. 2014)
Point Measure Correlation (PTMEA-CORR)	0.40 – 0.85 (Boone et al. 2014) or 0.20 – >0.90 (Bond and Fox 2007)

According to Bond and Fox (2007), Outfit MNSQ can inform the researcher about the suitability of the item in measuring the validity, while PTMEA-CORR informs the extent to which the development of the constructs has achieved its goals. A positive PTMEA-CORR value indicates that the item measured the construct to be measured, while a negative PTMEA-CORR value indicates otherwise (Bond and Fox 2015). On the other hand, ZSTD are t-tests of the hypothesis which can inform the researcher whether the data perfectly fits the

model. Any item that fails to fulfill these three criteria needs to be improved or modified to ensure the quality and suitability of the item (Müller, (2020)

Dimensionality

Unidimensionality is commonly understood as the degree to which a single latent trait can account for performance on the items that make up a questionnaire (Bond & Fox, 2007). It serves as an indicator of construct validity, indicating that the items should only measure one dimension (Sovey et al., 2022). In Rasch analysis, dimensionality is assessed using principal component analysis (PCA) (Zhong et al., 2023). According to Linacre (2007), the eigenvalue for the first contrast should fall between 1.4 and 2.1. A unidimensional construct accurately measures its intended target without interference from other variances. The unidimensionality index evaluates the instrument through Residual Principal Component Analysis (PCA). It is essential for the instrument to meet unidimensionality criteria (Sovey et al., 2022). If unidimensionality is not achieved, calculating the overall total and comparing respondents or items becomes unnecessary (Boone et al., 2014). Linacre (2018) states that a minimum variance of 20% is required to demonstrate the instrument's unidimensionality, while the unexplained variance in the first contrast should not exceed 15% (Fisher, 2007).

Items difficulty Index:

This is represented on the analysis table as item measures. The values are in logit placed in a scale of measurement. The positive values indicate values that are less familiar (difficult) to the respondents while the negative values are at the bottom side of the scale indicating the most familiar (easy) items to the respondents.

METHODOLOGY

The research employed a quantitative approach to collect and analyze the necessary data, transforming categorical data into an interval scale for enhanced measurement using Rasch model analysis (Boone & Starve, 2014). Following a literature review, the researchers were able to define various constructs to shape their questions. A draft instrument, referred to as TEDSAT, was created after reviewing relevant literature on the global code of ethics for the teaching profession, with a specific focus on Nigeria. Five ethical codes were chosen based on their significance to educational practices in teacher education, including obligation, integrity, law-abiding behavior, role modeling, and compassion (FRN, 2013). The content was validated by six experts.

The validation process for the self-developed items, conducted by these experts, showed positive content validity indices (I-CVI) as well as scale CVI (S-CVI). The evaluation used both the universal agreement (UA) method among experts (S-CVI/UA) and the average CVI (S-CVI/Ave) approach, resulting in satisfactory scores ranging from 0.80 to 0.96. This led to a pilot test of the 25-item instrument (with five items for each construct) on 37 respondents from a teacher training institution in Sokoto State, Northwest Nigeria, who were not part of the main sample population. Subsequently, the validity and reliability of the instrument were tested to evaluate its psychometric properties using the Rasch model, supported by Winsteps version 3.72.3, to analyze the instrument's reliability, item polarity, fit and misfit statistics, separation index, unidimensionality, and item difficulty index.

RESULTS AND DISCUSSION

The Sample of this pilot study consists of teacher educators (male and female, experienced and inexperienced) from Shehu Shagari College of Education Sokoto Northwest, Nigeria. Just like all the colleges of education in the country, these educators are saddled with responsibility of training in-service or pre-service teachers to obtain Nigeria Certificate in Education (NCE). A lower certificate compares to bachelor degree certificate to qualify them for teaching in Basic education sysem. The demographic data of the respondents was ignored as there is no stated objective relating to that. The educators sampled for the pilot test were 41 in which the questionnaire was administered to personally but only 37 questionnaires were retrieved and analyzed. The instrument contains 25 items covering five constructs inform of four Likert scale (Strongly Disagree = 1; to Strongly Agree = 4). The analysis was carried out using Winsteps 3.72.3 version in Rasch Model Analysis to

examine Reliability, item polarity, unidimensionality and Item difficulty Index to determine the psychometric properties of the items.

Reliability

Cronbach Alpha (α) reliability (KR-20) obtained in this study was 0.87. Person reliability and the separation indices for item reliability of ethical conduct for the 25 items are as follows: 0.87, 0.81; 2.07, 0.80; 2.03. The values pertaining to both the person and item separation indices for respondents and item constructs align with the guidelines established by Linarce (2005), which indicate that a separation value index greater than 2.0 is considered satisfactory.

Table 4. TEDSAT instrument Reliability

Construct	Total Item	Cronbach Alpha (α)	Person Reliability and separation	Item Reliability and separation
Ethical Conduct	25	0.87	0.81: 2.07	0.80: 2.03

The values of the person and item separation index for respondents and the item constructs are in line with the recommendations by Linarce (2005), who states that the separation value index of > 2.0 is good. This means the items are good and in accordance with Fisher (2005) who states that separation of > 2 is good.

Item Polarity

Item polarity is represented by the PTMEA Corr value. According to the Rasch Measurement Model, the validity of a questionnaire can be assessed through the analysis of its output (Bond and Fox, 2007). The primary output to consider is the polarity item, which is the point-measure correlation coefficient (PTMEA Corr). These values are listed under Point Measure Correlation, and all values should be positive (Rosli et al., 2020). If a value is negative (–), it indicates that the item does not effectively measure the intended construct and should be removed, as it may be too challenging or off-topic (Boone, 2016). The PTMEA Corr index categorizes item values as excellent if they exceed 0.40, good if they range from 0.30 to 0.39, and fair if they fall between 0.20 and 0.29 (Tesio et al., 2023; Yasin et al., 2015). If the value is between 0 and 0.19, the questionnaire is unable to differentiate between items (Bond and Fox, 2007). A high PTMEA Corr indicates that an item can effectively distinguish between respondents' abilities.

Table 5: Analysis of TEDSAT Ethical Conduct Scale PTMEA Corr

Item Entry Number	Items	PT Corr value	Expected	Value
1	OB1	72	49	Extremely good
2	OB2	48	48	Extremely good
3	OB3	72	49	Extremely good
4	OB4	39	48	Good
5	OB5	60	48	Extremely good
6	INT1	74	46	Extremely good
7	INT2	52	51	Extremely good
8	INT3	10	51	**Fail**
9	INT4	52	47	Extremely good
10	INT5	76	46	Extremely good
11	LA1	74	50	Extremely good

12	LA2	70	47	Extremely good
13	LA3	19	51	**Fair**
14	LA4	34	50	Good
15	LA5	59	50	Extremely good
16	RM1	62	48	Extremely good
17	RM2	57	48	Extremely good
18	RM3	53	48	Extremely good
19	RM4	30	51	Good
20	RM5	52	51	Extremely good
21	CO1	34	50	Good
22	CO2	16	50	**Fail**
23	Co3	40	50	Extremely good
24	CO4	64	50	Extremely good
25	CO5	27	50	**Fair**

A high PTMEA Corr means that an item can distinguish between the respondents' ability. A zero value or negative indicates that the link for the item response or respondent is in conflict with the variable or construct (Linacre 2007). Table 5 shows a summary of PTMEA Corr for 25 items in TEDSAT Ethical Conduct scale. All items in the TEDSAT ethical conduct scale show positive value but different indexes. Items with low PT MEA value less than .30 are: Co5 .27; Co2 .16; LA3 .19 and INT3. According to Bond & Fox (2007) the positive value of PTMEA Corr proves measuring items that are to be measured need to be carefully constructed. Therefore, items **Co5, Co2, LA3 and INT3** need to be revised or discarded.

Item Fit and Misfit Statistics

For TEDSAT ethical conduct scale, the fit statistics were carried out to check the degree of appropriateness of items within infit MNSQ and outfit MNSQ values of 0.6 to 1.4 (Bond & Fox 2007). The details of items classified on the basis of infit MNSQ and outfit MNSQ statistics are given in table 5. Infit MNSQ and outfit MNSQ value of each item and respondents should be expected in a range with 0.60 to 1.40 (Bond & Fox 2007).

MNSQ within the range of 0.6 < MNSQ < 1.4 to ensure that items have a suitable level of ability or need to measure the construct. If the value of the MNSQ index exceeds 1.4 the item is considered a misfit; an index value which is lower than 0.6 represents that the item can easily be predicted by the students. Another important metric is Z scores or Z Standard (ZSTD) expected to be between -2 to +2 value.

Table 6. Mistfit items in the study

MNSQ	ZSTD	Item
1.48	2.1	CO1
2.17	4.2	CO2
1.67	2.5	INT3
1.79	2.8	LA3

If the individual item does not fulfil the requirements, then the item will be considered for elimination. The analysis showed 6 items with mean square and ZSTD misfit: CO1 1.54 to 2.5; LA3 1.57 to2.3 respectively. And CO1 and LA3 outfit mean square/ ZSTD value of the item is 1.48 to 2.1, slightly above; LA3 with 1.179

to 2.8 respectively, just like the same case in infit value. Others with outfit values in table 6 above are CO2 and INT3 with MNSQ and ZSTD values as: 2.17 to ZSTD 4.2. And 1.67 MNSQ to 2.5 ZSTD respectively. indicating that 4 items do not fit the model, and should be dropped Bond and (Fox, 2015).

Unidimensionality

The unidimensionality index measures the instrument based on Residual Principal Component Analysis (PCA). The instrument must fit the condition of unidimensionality. If unidimensionality is not fulfilled, it is unnecessary to count the aggregate total and compare respondents or items (Boone et al., 2014). According to Linacre (2018), the minimum variance to show the unidimensionality of the instrument is 20%. The unexplained variance in the first contrast should not exceed 15% (Fisher, 2007). A unidimensional construct measures what it claims to measure (no presence of other variance outside of the construct

Table 7. STANDARDIZED RESIDUAL variance (in Eigenvalue units)

-- Empirical -- Modeled				
Total raw variance in observations =	37.4		100.0%	100.0%
Raw variance explained by measures =	12.4		33.2%	34.4%
Raw variance explained by persons =	4.9		13.0%	13.5%
Raw Variance explained by items =	7.6		20.2%	20.9%
Raw unexplained variance (total) =	25.0	8%	100.0%	65.6%
Unexplned variance in 1st contrast =	4.1		11.1%	16.6%
Unexplned variance in 2nd contrast =	3.0		8.1%	12.1%
Unexplned variance in 3rd contrast =	2.6		7.0%	10.5%
Unexplned variance in 4th contrast =	2.1		5.7%	8.6%
Unexplned variance in 5th contrast =	1.7		4.5%	6.7%

Table 7 indicates that the raw variance explained by the measures in the TEDSAT ethical conduct scale is 33.2% and it's above the expected minimum percentage of 20%. The unexplained variance in the first contrast should not exceed 15% (Fisher, 2007). The study result shows 11.1% as the unexplained variance in the first contrasts. But the variance's Eigenvalue is 4.1 though less than 5.0 (Linacre, 2010), indicating the absence of a second dimension. This is contrary to the eigenvalue of the first contrast suggested by Rosli, et al, 2020 to be between 1.4 and 2.1. As a way of ascertaining the argument of whether 5.0 or between 1.4 and 2.1, the researchers decided to carry dimensionality test for the 5 constructs to confirm each construct eigenvalue and the result as presented below on table 8.

Table 8. Ethical Conduct Constructs Dimensionality

Construct	Eigenvalue	Raw variance explained by measures	unexplained variance in first contrast
Obligation	1.8	37.2%	22.3%, 2nd 16.9%, 3rd 15.4%
Integrity	1.8	44.1%	20.6%, 2nd 15.7%, 3rd 12.1%
Law-Abiding	1.9	41.6%	22.1%, 2nd 16.2%, 3rd 13.9%
Role Model	1.6	44.4%	18.3%, 2nd 13.9%
Compassion	2.3	48.7%	1st 23.8%, 2nd 12.4%

The PCA were between 37.2% - 48.7% of variance explained by measures, which were above and sufficient in comparison to the 40% minimal value given by Linacre (2012). A value which is higher than 40% is 'good'

and it indicates that the TEDSAT instrument has a strong evidence of unidimensionality, to undoubtedly measure what it measured (Hayat, et al, 2020). Rasch argued that a value which is more than 40% was the best indicator for the unidimensionality of a test Linacre, 2005. The PCA of unexplained variance in 1st contrast was between 18.3% - 23.8% which were above the maximum value 15% for the 1st to 5th contrast. The unexplained variance in the 1st – 2nd contrast have value greater than 15% in most constructs denote some items in the constructs are weak and less valid in measuring the five constructs of ethical conduct (Krishnan and Idris, 2014). The eigenvalue of the first contrast was between 1.6 – 2.3 which are within the range suggested by Rosli, et al, (2020) to be between 1.4 and 2.1 with only compassion eigenvalue slightly above the range but within the range of 5.0 (Linacre, 2005), indicating the absence of a second dimension in five ethical conduct constructs (obligation, integrity, law-abiding, role model and compassion).

Item Wright Map

The Item Wright Map provides a visual representation of the alignment between item difficulty and respondents' abilities on the same interval scale (Boone, 2014). The map showed a wide distribution of teacher educators' abilities, with most items appropriately covering the range of ethical conduct construct levels. However, some gaps were noted, particularly at the higher end of the scale, indicating a need for additional items to better assess respondents with high ethical values.
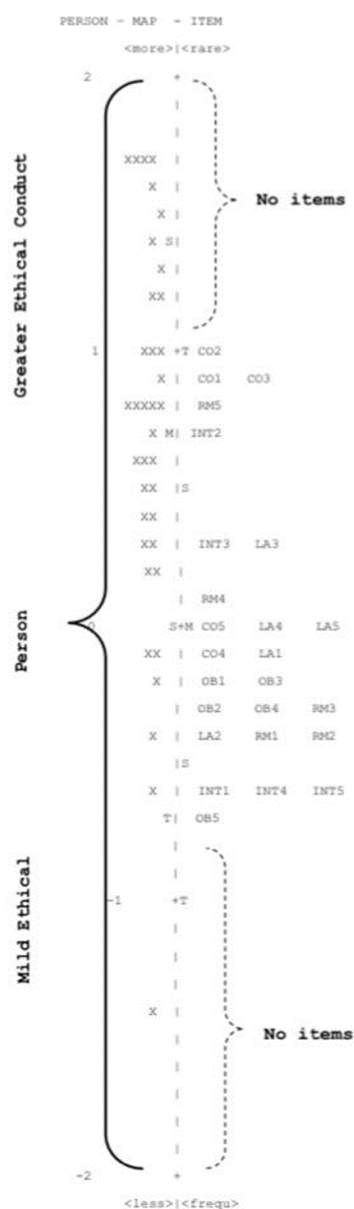

Figure 1. person-Item Map of TEDSAT ethical conduct self-assessment test

Compared with teacher educators' ethical behaviour, the test items are generally not very difficult: on the map the lowest item is "OB5, " the most difficult is CO2. Moderate-Ability Range (logit1 to 0): Items in the level 1, such as "CO2, CO1, CO3, RM5, and INT2", represent an active level of ethical conduct. The corresponding items are accessible to respondents with high abilities although may be out of reach for respondents at lower levels. A measure of participants' ability should be targeted to meet these objectives; for this reason it is important to target items at levels consistent with participants' levels, as this optimizes the accuracy of data collection (Wright, and Mok, 2004). Items and Participants at Mean Ability (Level 0): "INT2, Co5, LA4, LA5" illustrates the interaction of participants with average ability and items with moderate difficulty (e. g., "INT2, Co5, LA4, LA5"). This is the basis for scaling accuracy and this is where items at Level 0 are most closely matches to respondents, thus providing the greatest probability of measuring correctly (Bond and Fox, 2015). Typically this range presents the most information about the population being measured.

Frequent Items and Low-Ability Participants (Level -1). Participants positioned at this level exhibit lower ability or engagement, interacting primarily with the easiest items. In this study, the respondent lacks lower level item to match with. These items are essential for capturing baseline abilities and providing insights into the foundational traits of the sample (Boone et al., 2016). Item-Person Matching and Misalignment. The Rasch Model emphasizes the importance of aligning items with participants' abilities. The clustering of items and participants around logit Levels 1 and 0 suggests a good match for most of the sample. However, any significant gaps between items and participants at certain levels might indicate issues with scale sensitivity or areas needing refinement (Linacre, 2007). As it is in logit scale +2 above where respondents with high ethical conduct have no corresponding high-level items. And one candidate at logit scale -1 without corresponding item which signifies items are of moderate standards. None of the respondent is found at logit +2 but one respondent (person 14) operates at -1 logit value of ethical conduct traits without corresponding items. This person should be removed according to literature (Boone et al., 2016).

RESULTS AND DISCUSSION

The Rasch measurement model has enabled the researcher to detect problematic items, so that there can be improvement or excluded to increase the validity and reliability of the instrument to measure the constructs of future use. Overall, the analysis discovered that some items in the TEDSAT ethical conduct instrument needed refinement while others had to be dropped. It is necessary to remove or refine items that are incompatible with the Rasch model in order to better the validity and reliability of the TEDSAT ethical conduct instrument. Other than that, the analysis from the Principal Component Analysis (PCA) in the Rasch model detected that the sub-constructs of TEDSAT ethical conduct instrument were individually unidimensional and that the TEDSAT ethical conduct instrument with the five constructs were quite unidimensional. This signals that the TEDSAT ethical conduct instrument is able to measure the five constructs with refinement and dropping of some items in the instrument to effectively measure teacher educators' ethical conduct.

The Reliability test revealed that the TEDSAT ethical conduct instrument presented a good internal consistency based on the Cronbach's alpha (KR-20) value, and has a very high item reliability. Thus, it can be said to be a reliable instrument for measuring teacher educators, ethical conduct. More so, it was discovered that the TEDSAT instrument has high value of item separation which show that the instrument has a greater spread as it is argued that an item separation value which exceeds 2.0 indicates that the items in the instrument are strongly accepted (Siew, et al., 2019).

The TEDSAT ethical conduct instrument has a raw variance by measure value higher than 40% which is 'good' and it indicates that the TEDSAT instrument has a strong evidence of unidimensionality, to undoubtedly measure what it measured. The unexplained variance in the 1st – 2nd contrast have value greater than 15% in most constructs denote some items in the constructs are weak and less valid in measuring the five constructs of ethical conduct. The eigenvalues in the five constructs are within the range suggested by Roslin, et al., (2020) between 1.4 and 2.1 with only compassion eigenvalue slightly above the range but within the range of 5.0 (Linacre, 2005), showing lack of a secondary dimension in five constructs of ethical behavior is highlighted. (obligation, integrity, law-abiding, role model and compassion).

In the analysis of item fit statistics, it was found that certain items exhibit MNSQ values ranging above 0.6 to 1.4, indicating they are categorized as over-fit or misfit (Bond & Fox, 2007) which are inconsistent (Bond & Fox, 2007). When the MNSQ value is accepted, the ZSTD was ignored (Linacre, 2018). If the MNSQ condition is not fulfilled, the items should either be refined or removed. Thus, items below were removed which are the same items with low PTMEA Corr indicating the reliability of TEDSAT ethical conduct instrument in measuring that which is meant to measure consistently. These questions are: Co1: I do not concern myself with colleagues' problems; LA3: I would not be embarrassed if my entire life was shown to the world; CO2: I do not feel bad when a teacher trainee cries in front of me and INT3: I apply ethical principles under all circumstances with no exception.

In the same direction, the person-item map indicate that the top and lower scale of the map are not having corresponding items. Instead, the item and the respondents converge at the middle of the map signifying that the item difficulty is moderate to the respondents' level of ethical value compliance. Thus, dropping or refining the problematic items in the ethical conduct TEDSAT instrument may improve on the validity and reliability.

Implications for Practice and Policy

Rasch analysis underscore the importance of precision, accuracy replicability of TEDSAT scale assessment tools and cultural adaptability. This approach can be extended to other measuring learning outcomes at the affective domain not just ethical conduct but other areas of educational assessment due to validity and reliability of instruments certainty worldwide. The study's contribution lies in its application of Rasch analysis to a culturally specific context, addressing a critical gap in the literature on psychometric validation of ethical conduct self-assessment instruments in Nigerian education. Establishing the psychometric properties of the TEDSAT ethical instrument in measuring educators ethical conduct was a crucial step taken by the researchers to ensure that the actual research could be executed effectively. More importantly, the implication from the Rasch measurement model in establishing the validity and reliability of the pilot test instrument has been instrumental to the researchers in enhancing the quality of the instrument's precision, accuracy validity and reliability. To maintain the standard of items established through Rasch Model Analysis, some items need to be refined while others dropped for better instrument for adoption to enables it ex-rays the ethical practices of educators in Nigerian Colleges of Education for professional training and groundwork for equity and quality assessment of latent traits which is one of the core values of National Policy on Education in that society.

CONCLUSION / RECOMMENDATIONS FOR PRACTICE

Teacher educators' responses on the test scale were found to be adequate, the quality of items showed satisfactory internal consistency. The unidimensional condition was satisfied at the test level but not completely satisfied at the construct level. The test revealed that the teacher educators in the sample conduct themselves more ethically than the low level of difficulty of the questions suggested. And so we begin to polish some pieces within the constructs. Rasch Model Analysis will boasts question banks of morally related fields in the country on the Validity and reliability of TEDSAT ethical scale as tool for measure of ethical conduct of teacher educators in Northwest Nigeria. The TEDSAT ethical scale showed moderate level difficulty and high internal consistency.

In order to ensure that professional codes of conduct given the attention they deserve in the curriculum, particularly in teacher training institutions, the National Commission on Colleges of Education (NCCE), Teacher Registration Council of Nigeria (TRCN), Ministry of Education, and Education Institutions can use the validated TEDSAT ethical conduct scale to assess and improve teacher training programs at colleges of education, National Teachers Institutes, and universities across the six geopolitical zones of the country. Institutions can use this tool to identify areas where educators need more training in the affective domain, which will ultimately lead to a teaching workforce that is more ethically sensitive.

Future Research Directions

Future researchers should prioritize testing the instrument in diverse geo-political zones, marked by varied demographic profiles, in order to build upon the encouraging results of this study. Additionally, conducting cross-cultural validation studies would increase the TEDSAT ethical conduct scale's global applicability. Other recommendations include improving misfit items and incorporating additional ethical constructs to ensure the

instrument's precision and comprehensiveness. In summary, this research lays the groundwork for ongoing efforts to develop assessment tools that are both culturally sensitive and reliable. The incorporation of robust psychometric methods, such as Rasch analysis, into instrument validation represents a significant step forward, ensuring that assessments of ethical values are accurate, meaningful, and applicable across diverse educational and cultural settings.

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