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A Survey of Examination Malpractices Using The Randomized Response Technique

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Abstract

We administered a questionnaire survey using both the randomized response (RR) technique and the direct questioning (DQ) technique to directly estimate the prevalence of examination malpractices in The Federal University of Technology, Akure in Ondo State, Nigeria. The effectiveness of the RR technique in reducing response and non-response biases was also assessed and we examined the relationship between examination malpractices and key demographic variables. It was discovered that RR technique was effective in reducing non-response bias, but its effectiveness in reducing response bias could not be established statistically. Some relationships were found between the demographic variables examined and examination malpractices.

Keywords: Randomized Response, non-response bias, response bias, evasive response

1.0 Introduction

Education is the key to development in any nation and Nigeria is no exception. This has led to a quest to acquire education by all means as employers of labour place emphasis on certificates especially that of the university before one can be given any reasonable position in any organization.

The main objective of university education is to train students to acquire the requisite knowledge and skills to enable them to contribute effectively to national development [1]. This training requires periodic assessment and evaluation in form of examinations to ascertain the level of competence of students. Although an examination is not the only instruments for assessing students' knowledge in the university, they have emerged as the major established yardstick and the most practical way of assessment. This has led to students devising different types of methods to pass examinations at all cost; thereby resulting in examination malpractice. Some of these methods are impersonation, exchange of answer scripts by students, writing relevant information on parts of the body and pieces of paper etc [2]. Examination malpractice can be defined as a deliberate act of wrong doing, contrary to official rules. It is designed to place a candidate at an unfair advantage or disadvantage. It is a careless, illegal or unacceptable behavior by a candidate in a formal test of his knowledge or ability in a particular subject [3]. It could also be said to be an act of omission or commission which compromises the validity and integrity of any examination [4]. Examination malpractice is counter-practice that is against ethics of examination.

It is an act of disrespect to all rules and regulations guiding the good conduct of any examination or any evaluation process. Examination malpractice has assumed a frightening proportion in Nigeria. This, therefore, should be a concern to stakeholders in education.

Despite interest on examination malpractices among students of higher Institutes of learning, very little research has been carried out and not much is known about the extent of the problem. Empirical Investigation into Examination Malpractices is needed to understand the extent of the problem, but current research is hampered by difficulties in obtaining sensitive information from Students. One main limitation facing researchers in investigating Examination Malpractices is the inability to observe individual malpractices behaviour. As such, most empirical evidence is based on individuals' self-report (i.e. survey) to describe malpractices behaviour. Surveys of Examination Malpractices are

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complicated by the sensitive nature of the topic. In general, Examination Malpractices is perceived to be illegal and socially undesirable behaviour, that individual is reluctant to admit to having such behaviour. The threat of penalties like carryover, expulsion from school, giving extra semesters etc. can induce individual either to lie about their examination malpractices behaviour (response bias) or to refuse to take part in the study because they wish to avoid answering sensitive question (non-responses bias). Response and Non Response biases in a survey affect the validity and the generality of the result thereby making reliable estimate of examination malpractices difficult to obtain.

The problem facing the researcher is how to encourage participants to respond and then to provide truthful response in survey. A suggested solution is the Randomized Response (RR) Techniques developed by Warner [5]. Randomized Response (RR) was developed for the purpose of improving response rate by protecting respondent privacy and avoiding bias answer. It was introduced by Warner [5] as technique to estimate the percentage of the people in a population that has sensitive attribute. In such cases respondents may decide not to reply at all or give incorrect answer. The basic idea of Randomized Response is to scrabble the data in such a way that the real status of the respondent cannot be known. It uses probability theory to protect the privacy of an individual's response and has been used successfully in several sensitive research areas, such as abortion, drugs and assault [6].

Surveying human population to study sensitive attributes often results in evasive answers when individuals of the human population are asked directly. It is natural tendency of the humans to hide their socially unaccepted and illegal characters from the society and authorities. The reason might be the fear of getting punished by the authorities or the social stigma which a particular character carries. That's why, when population consisting of such individuals is studied to estimate the prevalence of a particular sensitive attribute, they, either refuse to respond, or at best, give false answers [6]. Various modifications of Warner's [5] randomized response model (RRM) and other developments of RRM are given by various authors, including [7,...,17] among many others.

MOTIVATION

There have been calls from several bodies (Governmental and Non Governmental) to use the Randomized Response (RR) technique to investigate Examination malpractices among students, but a review of literature shows that little has been done despite interest on examination Malpractices among students of higher Institutes of learning, very little research has been carried out and not much is known about the extent of the problem which makes the habit to be more rampant among students of higher learning. This work is motivated by the need to gather more reliable and meaningful data on Examination Malpractices. We conducted a survey designed to achieve the following objectives.

AIM AND OBJECTIVES

The specific aim of this project is to estimate the proportion of students involved in examination malpractices using unrelated question with a non sensitive characteristics, as suggested by [7] and [8]. Thus, the study is set to achieve the following objectives:

1. To assess the effectiveness of the Randomized Response (RR) technique in reducing response and non-response biases in surveys asking sensitive questions; and
2. To examine the relationship between Examination Malpractices and key demographic variables

WARNER`S RANDOMIZED RESPONSE TECHNIQUE (RRT)

Warner[5] proposed an ingenious method to procure sample data for estimating the proportion of individuals possessing sensitive characters. Randomized Response (RR) techniques were developed for the purpose of improving response rate by protecting surveyee's privacy so as to avoid answer bias. It is a technique use to estimate the percentage of people in a population (U) that has a stigmatizing attribute (A) [6]. In such cases respondents may decide not to reply at all or to answer incorrectly. The usual problem faced by researchers is to encourage participants to respond, and to provide truthful response in surveys. The RRT uses probability theory to protect the privacy of an individual's response, and has been used successfully in several sensitive research areas, such as abortion, drugs and assault [6]. The basic idea of Randomized Response is to scramble the data in such a way that the real status of the respondent cannot be identified.

Consider first the estimation of a binomial proportion-the true proportion π_A of respondents who belong to a certain class A or have committed a certain act. By ingenious use of a randomizing device, Warner [5] showed that it is possible to estimate this proportion without the respondents revealing his or her personal status with respect to this question. The objective is to encourage truthful answers while fully preserving confidentiality. The randomizing device, such as a spinning arrow or box with red and white balls, selects one of two statements or questions, each requiring a "Yes" or "No" response, to be presented to the respondents. The interviewer does not know which question any respondent has

answered but does know the preset probabilities P and 1 – P with which the two statements are presented. The success of the method depends of course, on the respondents being convinced that by participating he or she will not be revealing personal status with regard to the sensitive issue.

In Warner's original proposal the following statements are recorded:

"I am a member of class A" (Presented with probability P)

"I am not a member of class A" (Presented with probability 1 – P).

Here, with a random sample of n respondents, the interviewer records a binomial estimate $\hat{\theta} = \frac{m}{n}$ of the proportion θ of "yes" answers. If the questions are answered truthfully, the relation between θ and π_A in the population is given as

$$\theta = \pi_A P + (1-P)(1-\pi_A) = (2P-1)\pi_A + (1-P) \quad (1)$$

With known P, this relationship suggests the unbiased estimate of the true probability of yes response, is given by

$$\hat{\pi}_{AW} = \frac{\hat{\theta}-(1-p)}{(2p-1)}; P \neq \frac{1}{2} \quad (2)$$

Where the subscript "w" denotes Warner and the variance is given as

$$V(\hat{\pi}_{AW}) = V\left[\frac{\theta-(1-P)}{(2P-1)}\right]$$

$$V(\hat{\pi}_{AW}) = \frac{\theta(1-\theta)}{n(2p-1)^2}$$

Where θ follows binomial distribution

$$V(\hat{\pi}_{AW}) = \frac{(\pi_A - \pi_A^2)}{n} + \frac{p(1-p)}{n(2p-1)^2} \quad (3)$$

The first term in $V(\hat{\pi}_{AW})$ is the variance that $V(\hat{\pi}_{AW})$ would have if all n respondents answered truthfully a direct question about class A membership.

Except for π_A near 0.5 and P > 0.85, the second term is greater than the first, often much greater. The method is thus quite imprecise in general. This might be expected since the interviewer does not know whether a "yes" answer implies membership in a class A or the opposite.

However, Warner's method may give a smaller mean square error (MSE) than a direct sensitive question would, if the latter produced numerous refusals or false answers.

3. The Unrelated Question Design

An important improvement to the Warner model was proposed by [8] who suggested the use of an unrelated question with a non-sensitive characteristic. For example:

Question 1: Did you cheat in your last examination?

Question 2: Did you watch the 10:00 pm news yesterday?

This unrelated question approach requires two independent samples with different selection probability ($p_1 \neq p_2$) to estimate two parameters: π_A for the sensitive behavior, and π_u for the non-sensitive behavior. It has the improvement of reducing the sensitivity of the design, as only one of the questions relates to the sensitive topic. However, the samples also are used to estimate the distribution of the unrelated question (*i.e.*, watching news) which may not be of interest to the researcher. This technique is referred to as the *unrelated question design with an unknown distribution*. The design was expected to further reduce response bias and improve the efficiency of the estimate. . If it is necessary to estimate both $\hat{\pi}_A$ and $\hat{\pi}_u$, we can have two random samples of sizes n_1, n_2 for the sensitive questions. With $\emptyset_1, \emptyset_2$ denoting the proportions of "Yes" answers in the population defined by the choices P_1, P_2 The estimated proportion of affirmative responses to the sensitive question and the associated variance are calculated using the following equations:

$$\emptyset_1 = P_1\pi_A + (1-P_1)\pi_u \quad (4)$$

$$\emptyset_2 = P_2\pi_A + (1-P_2)\pi_u \quad (5)$$

$$\hat{\pi}_u = \frac{\hat{\emptyset}_1(1-P_2) - \hat{\emptyset}_2(1-P_1)}{(P_1-P_2)}$$

If *Var(X-Y)=Var(X)+Var(Y)*, where X and Y are variables of interest. Then

$$V(\hat{\pi}_{Au}) = V\left[\frac{\hat{\emptyset}_1(1-P_2)}{(P_1-P_2)}\right] + V\left[\frac{\hat{\emptyset}_2(1-P_1)}{(P_1-P_2)}\right] \quad (6)$$

$$= \left[\frac{1-P_2}{P_1-P_2}\right]^2 V(\hat{\emptyset}_1) + \left[\frac{1-P_1}{P_1-P_2}\right]^2 V(\hat{\emptyset}_2) \quad (7)$$

$$= \left[\frac{1-P_2}{P_1-P_2}\right]^2 \frac{\emptyset_1(1-\emptyset_1)}{n_1} + \left[\frac{1-P_1}{P_1-P_2}\right]^2 \frac{\emptyset_2(1-\emptyset_2)}{n_2} \quad (8)$$

Hence

$$V(\hat{\pi}_{Au}) = \frac{1}{(P_1-P_2)^2}\left[\frac{\emptyset_1\,(1-\emptyset_1)(1-P_2)^2}{n_1} + \frac{\emptyset_2\,(1-\emptyset_2)(1-P_2)^2}{n_2}\right]. \quad (9)$$

The unrelated question design was further improved by [7]. They examined a similar design where the distribution of the non-sensitive question is known in advance. Knowing the distribution of the non-sensitive question offers a substantial improvement in the precision of the estimate of the sensitive characteristic and reduces the number of samples to one, as there is now only one parameter to estimate. The *unrelated question design with a known distribution* uses a simplified version of the original unrelated question equations to estimate the proportion of the sensitive characteristic and the sampling variance: The first statement remains unchanged. If all respond truthfully, the population proportion of "yes" answers is given by

$$\vartheta = \pi_A P + (1 - P)\pi_u \quad (10)$$

Where π_u is the proportion in the sampled population who watch the 10:00 pm news yesterday. If π_u is known, the obvious (and maximum likelihood) estimate of $\pi_A$is

$$\hat{\pi}_{Au} = \frac{\hat{\vartheta}-(1-P)\hat{\pi}_u}{P} \quad (11)$$

$$V(\hat{\pi}_{Au}) = V\left[\frac{\hat{\vartheta}-(1-P)\hat{\pi}_u}{P}\right] = V\left[\frac{\hat{\vartheta}}{P}\right] - V\left[\frac{(1-P)\hat{\pi}_u}{P}\right] \quad (12)$$

Since $V\left[\frac{(1-P)\hat{\pi}_u}{P}\right] = 0$

The variance becomes

$$V(\hat{\pi}_{Au}) = \frac{\vartheta(1-\vartheta)}{nP^2} \quad (13)$$

Although the concept of the unrelated question design was introduced by [7] and [8] offered a more comprehensive treatment of the refined RR technique and a theoretical proof that it provided a significant improvement on the Warner design by increasing the precision and efficiency of the sensitive estimate, especially when the distribution of the non-sensitive question is known.

Further extensions of the RR technique include the use of polychotomous measures and quantitative measures. Despite the variety of extensions and variations that have emerged since Warner's original design, the unrelated question design developed by [7] has remained one of the most popular RR techniques used by researchers investigating sensitive issues.

SURVEY METHODOLOGY

We designed two survey instruments: one instrument used the Randomized Response Technique (RRT) to ask the sensitive questions about examination Malpractices, while the other used the traditional Direct Questions (DQ) technique. Otherwise, the two instruments were identical. Both survey instruments offered respondents the protection of anonymity. Respondents of the RR instrument had the added protection of the randomizing procedure. We used the unrelated question design with a known distribution in the RR instrument. We made a few decisions to select the most suitable RR design.

Non-sensitive Question and Known Distribution

In choosing a non-sensitive question and a known distribution, previous studies have used known demographic distributions for certain populations, or have asked respondents if they were born in a certain month, but these measures can be unreliable, with problems of memory recall, respondent knowledge and the validity of the demographic statistics used. Because of these limitations, we followed the practice of several more recent studies [18,19] and used the serial number on a bank note to create a known distribution.

The choice of the known distribution will have an impact on the variance of the sensitive Estimate. The probability of getting 'yes' response is given by equation (10). where: π_A = the true proportion of respondents with the sensitive behavior; and π_u = the proportion of 'yes' response to the non-sensitive question.

The observed proportion of 'yes' responses (θ) increases as the known distribution (π_u) increases. This leads to a larger numerator in equation (13), and results in a higher variance and a less efficient estimate of the prevalence of the sensitive behavior. Setting π_u to zero is in effect direct questioning, as any 'yes' response obtained only could refer to the sensitive question. A smaller π_u leads to a smaller variance of the sensitive estimate. On the other hand, a larger π_u provides more protection to respondents as there is a greater likelihood of more respondents answering 'yes.' Again, a trade-off exists between respondent protection and estimation efficiency. In the RR survey instrument, we asked the respondents to use a digit in the bank note's serial number as a randomizing device, directing them to answer either the sensitive or non-sensitive question. The non-sensitive question also uses the same digit to create a known distribution of answering 'yes,' which has a probability of 1/3 or 33.3% [6]. Ideally, the chosen known distribution for the non-sensitive question should be as close as possible to the sensitive attribute being estimated. With the benefits of hindsight, we found that the known

probability for the non-sensitive question we used was too high. The large π_u we used has substantially inflated the sampling variance of the estimator for the sensitive attribute.

Population and Sample

The study was carried out among students of the Federal University of Technology Akure. Only the Undergraduates students were selected as the Pre-Degree of Sciences (PDS), University Diploma of Sciences (UDS) and Post Graduate Students were not selected in the survey.100 students were randomly given questionnaire from each school in the University using the RRT and 25 students from each school were interviewed using the direct interview approach.

HYPOTHESES DEVELOPMENT

We tested the following hypotheses to assess whether the RR technique was effective in reducing non-response and response biases in survey asking sensitive questions:

FIRST HYPOTHESIS

H_0: The response rate will be the same for individual receiving the RR survey instrument with for those receiving the Direct Question survey instrument Vs

H_1: The response rate will be higher for individual receiving the RR survey instrument than for those receiving the Direct Question survey instrument

SECOND HYPOTHESIS:

H_0: The proportion of students admitting to Examination malpractices is the same for those completing the RR survey instrument than for those completing the Direct Question survey instrument.

H_1: The proportion of students admitting to Examination malpractices will be higher for those completing the RR survey instrument than for those completing the Direct Question survey instrument

The first hypothesis tests whether the RR technique will increase the response rate in the survey.

The second hypothesis tests whether response bias is reduced by use of the RR technique and is based on the assumption that a higher proportion of respondents admitting evasion indicate more truthful reporting.

Four more alternative hypotheses also have been developed to investigate the relationship between six Examination malpractices behavior and students' demographic variables or attributes. The null hypothesis for each is hypotheses of no difference between the examination malpractices and the demographics variables are,

H_3: students with lower C.G.P.A will display higher proportion of Examination malpractices than those students with higher C.G.P.A.

H_4 : Male students will display a higher proportion of Examination malpractices than their female students.

H_5: Students in a higher level will have higher proportion of Examination malpractices than students in a lower level

H_6: There is no significant age difference among students who involve in examination malpractices.

Survey Procedure

Questionnaire survey was used because the use of RR technique required larger samples for effective data analysis. We surveyed all students in the school in order to obtain a representative sample of the whole students' individuals.

The target populations for this study are undergraduate students of the institution; the total sample was 100 for the DQ survey instrument, and 600 for the RR survey instrument. The larger sample for the RR instrument was meant to compensate for the inflated sampling variances caused by the randomizing procedure [6]. We used a screening question at the beginning of the survey instruments to make sure the respondents were undergraduate students of federal university of technology Akure.

Z-tests were used in hypotheses testing. All comparisons involving RR data used the estimated proportion of evasion and the sampling variance based on equations (11) and (13) to

Calculate the z-score, using the standard formula:

$$Z = \frac{\hat{\pi}_1 - \hat{\pi}_2}{\sqrt{\text{var}(\hat{\pi}_1) + \text{var}(\hat{\pi}_2)}} \qquad (14)$$

Where: $\hat{\pi}_i$ = estimated proportion of the respondents admitting examination malpractices; and

Var($\hat{\pi}_i$) = variance of the estimated proportion.

The value of Z is compared with the table value at 0.05 level of significance.

RESULTS

The first hypothesis: **Non-Response Bias**

The first hypothesis looked at the effectiveness of the RR technique in reducing non-response bias. This hypothesis is tested by comparing the students overall responses and useable responses to examination malpractices for both survey instruments (RR and DQ). The result is shown in Table1.0

TABLE 1.0 **RECEIVED INFORMATION**

	Randomized Response Instrument	%	Direct Questioning instrument	%	Z-Scores
Number Originally Sent	600		100		
Number Unreturned	54		18		
Number Returned	546	100%	82	100%	
Response Received [1]	488	89.37%	58	70.73%	4.67117*
Invalid Response [11]	40	7.326%	14	17.07%	
Not Undergraduates Returned [111]	12	2.197%	3	3.659%	
Usable Response	481	79.84%	31	50.0%	6.64925*

i. The Response Rate and the useable Response were calculated based on the number returned.

ii. Returned Survey Instrument were classified as invalid and were not included in the data set if the entire questionnaire was left blank or the majority of the questionnaire had not been completed or the respondent clearly did not follow the RR techniques order.

iii. Survey Instruments returned by respondents who are not undergraduate students were excluded

* Statistically significant at the 0.05 level.

Table 1.0, Shows that there are statistical significant at 0.005 level of significance, between the overall Response rate of the RR instruments (89.37%) and DQ instruments (70.73%) and between the useable response rate of the RR (79.84%) and DQ (50.00%) instruments. The null hypothesis that the two instruments had the same response rate is rejected. The response rate is higher for individual receiving the RR survey than the DQ survey instrument. Therefore, we do not accept H_o (i.e we do not reject H_1). Thus, the RR response technique has reduced the non-response bias of the survey.

The Second Hypothesis: **Response bias**

The second hypothesis examined the effectiveness of the RR technique in reducing response bias. The result is summarized in Table 2.0

Table 2.0**: Prevalence of Examination Malpractices and Responses Bias**

	Randomized Random Instrument				**Direct Question Instrument**				
Type of Examination Malpractices	**Total Usable Response**	**Yes Responses**	**Proportion with sensitive behaviour***	**Variance of the sensitive behavior****	**Total Usable Response**	**Yes Responses**	**Proportion of yes*****	**Variance of yes******	**Z-SCORE**
Q2B	481	144	29.91%	0.0008894853654	31	5	16.13%	.00436373401	1.6375
Q3B	481	118	22.19%	.000732547958	31	6	19.35%	.0050350777	0.369871
Q4B	481	180	40.60%	0.001023225423	31	4	12.90%	0.003625255 95	3.065889#
Q5B	481	102	17.44%	0.0006108208665	31	4	12.90%	0.003625255 95	0.6497469
Q6B	481	98	16.24%	0.0005773950191	31	3	9.68%	.00281964351	0.969528313
Q7B	481	102	17.44%	0.0006108208665	31	0	0.0%	0	2.5427845#

*The estimated proportion of 'yes' responses to the sensitive question are calculated using Equation (11)
** Variance of the sensitive behavior is calculated using Equation (13)
*** Proportion of yes responses to the direct question instruments are calculated using

$$P=\frac{m}{n} \quad (15)$$

Where m= the number of yes to the direct question
n= the sample size
p= the proportion of yes response to the DQ
**** Variance of the responses to the direct question instruments are calculated using

$$Var(P)=\frac{p(1-P)}{n} \quad (16)$$

Where n= the sample size
p= the proportion of yes response to the DQ
# Statistically significant at the 0.05 level.

Table 2.0, show that the estimated proportion admitted to examination malpractices using the RR technique are higher than that of DQ technique for the malpractice types 'On the Examination day, did you ignore your seat and sit beside your friends (2B)' (RR 29.91% ,DQ 16.13%), 'Did you copy the next person if you forget any question (3B)' (RR 22.19% , DQ 19.35%), 'Did you bring in CHIPS to the Examination Hall (4B)' (RR 40.60% , DQ 12.90%), 'Did you hire other people to write the Examination through impersonation (5B)' (RR 17.44% , DQ 12.90%), 'Did you bring in electronic devices to examination hall and use it when you don't know any question (6B)' (RR 16.24% , DQ 9.68%) and 'did invigilators connive with you to cheat in Examination hall in case you forget any question (7B)' (RR 17.44% , DQ 0.0%). However, the differences between the two techniques are only significant at the 0.05 levels for Questions 4B and 7B alone, and not significant for other Questions, (i.e, Questions 2B, 3B, 5B, 6B). The higher estimated prevalence of examination malpractices using the RR technique may suggest that the use of the RR technique has reduced bias. On the other hand, the higher estimated proportion also may be attributed to the randomizing procedure and the responses to the non-sensitive questions. The effectiveness of the RR technique in reducing response bias cannot be established statistically.

The Third Hypothesis: C.G.P.A

The alternative hypothesis for the third hypothesis hypothesized that students with lower C.G.P.A will display higher proportion of Examination malpractices than those students with higher C.G.P.A. The result is summarized in Table 3.0

TABLE: 3.0 **C.G.P.A and Examination Malpractices (RRT)**

TYPE OF EXAMINATION MALPRACTICES	**C.G.P.A GROUP**	**No. of Responses**	**Proportion of Examination Malpractices** *	**Variance****	**Z-Scores**
Q2B	LOWER	98	16.25%	0.0005774269167	
	UPPER	46	0.80%	0.0000336713479	6.41882#
Q3B	LOWER	66	6.74%	0.0002666945564	
	UPPER	52	2.59%	0.000107043956	2.52466#
Q4B	LOWER	94	15.06%	0.000542745301	
	UPPER	86	12.68%	0.0004697770801	1.00140
Q5B	LOWER	52	2.59%	0.000107033956	
	UPPER	50	1.99%	0.0000827527260	0.57535
Q6B	LOWER	46	0.80%	0.0000336713479	
	UPPER	52	2.59%	0.000107033956	-3.0289#
Q7B	LOWER	53	2.88%	0.000118675209	
	UPPER	49	1.70%	0.0000709024566	1.07618

*The estimated proportion of 'yes' responses to the sensitive question are calculated using Equation (11)
** Variance of the sensitive behavior is calculated using Equation (13)
# statistically significant at the 0.05 level

Consistent with the hypothesized direction in H_3, the result in Table 3.0 indicate that students with lower C.G.P.A will display higher proportion of Examination malpractices than those with higher C.G.P.A. for the malpractice types 'On the Examination day, did you ignore your seat and sit beside your friends (2B)' (LOWER 16.25%, UPPER 0.80%), 'Did you

copy the next person if you forget any question (3B)' (LOWER 6.74% , UPPER 2.59%), 'Did you bring in CHIPS to the Examination Hall (4B)' (LOWER 15.06% , UPPER 12.68%), 'Did you hire other people to write the Examination through impersonation (5B)' (LOWER 2.59 % , UPPER 1.99%), 'Did you bring in electronic devices to examination hall and use it when you don't know any question (6B)' (LOWER 0.80% , UPPER 2.59%) and 'did invigilators connive with you to cheat in Examination hall in case you forget any question (7B)' (LOWER 2.88% , UPPER 1.70%). However, the differences between the two techniques are only significant at the 0.05 level for examination malpractice Questions 2B, 3B and 6B alone, and not significant for other examination malpractices Questions, (i.e., Questions 4B, 5B and 7B).

The Fourth Hypothesis: GENDER

The alternative hypothesis for the fourth hypothesis hypothesized that male student will display a higher proportion of Examination malpractices than their female students. The result is summarized in Table 4.0

TABLE 4.0 GENDER and EXAMINATION MALPRACTICES (RRT)

TYPE OF EXAMINATION MALPRACTICES	**Sex**	**No. of Responses**	**Proportion of Examination Malpractices** *	**Variance****	**Z-Scores**
Q2B	MALE	92	14.47%	0.0005251046	
	FEMALE	52	2.59%	0.000107043	5.1602354#
Q3B	MALE	69	7.6358%	0.000299389	
	FEMALE	49	1.6958%	7.09025E-05	3.4189472#
Q4B	MALE	114	21.00%	0.000703891	
	FEMALE	66	6.7448%	0.000266695	5.3213654#
Q5B	MALE	56	3.7748%	0.000153926	
	FEMALE	46	0.8048%	3.36713E-05	2.3873937#
Q6B	MALE	50	1.990%	8.27527E-05	
	FEMALE	48	1.3988%	5.85685E-05	0.6457376
Q7B	MALE	56	3.7748%	0.000153926	
	FEMALE	46	0.8048%	3.36713E-05	2.3873937#

*The estimated proportion of 'yes' responses to the sensitive question are calculated using Equation (11)
** Variance of the sensitive behavior is calculated using Equation (13)
# statistically significant at the 0.05 level

Table 4.0, indicates that higher proportion of examination malpractices occurred among male students than female students for the malpractices questions, 'On the Examination day, did you ignore your seat and sit beside your friends (2B)' (MALE 14.47%, FEMALE 2.59%), 'Did you copy the next person if you forget any question (3B)' (MALE 7.635% , FEMALE 1.695%), 'Did you bring in CHIPS to the Examination Hall (4B)' (MALE 21.00% , FEMALE 6.7448%), 'Did you hire other people to write the Examination through impersonation (5B)' (MALE 3.7748 % , FEMALE 0.8048%), 'Did you bring in electronic devices to examination hall and use it when you don't know any question (6B)' (MALE 1.99% , FEMALE 1.3988%) and 'did invigilators connive with you to cheat in Examination hall in case you forget any question (7B)' (MALE 3.7748% , FEMALE 0.8048%). Pointing to the same direction to the hypothesized one. The differences are statistically significant at 0.05 levels for all Questions; Hence H_4 is accepted for all Questions except for 6B.

The Fifth Hypothesis: LEVEL

The alternative hypothesis for the fifth hypothesis hypothesized that Students in a higher level (300Level to 500Level) will have higher proportion of Examination malpractices than students in a lower level (100level to 200Level). The result is summarized in Table 5.0

Table: 5.0 LEVEL and EXAMINATION MALPRACTICES (RRT)

TYPE OF EXAMINATION MALPRACTICES	LEVEL	No. of Responses	Proportion of Examination Malpractices *	Variance**	Z-Scores
Q2B	LOWER	86	12.68%	0.000469931698315173	
	HIGHER	58	4.37%	0.000177266907224078	3.8023031#
Q3B	LOWER	66	6.74%	0.000266873567900248	
	HIGHER	52	2.58%	0.000106918133525625	2.2258463#
Q4B	LOWER	108	19.21%	0.000658714081667014	
	HIGHER	72	8.53%	0.000330934785216051	4.1082673#
Q5B	LOWER	55	3.48%	0.000142429353752494	
	HIGHER	47	1.10%	0.00004623572924688	2.0700109#
Q6B	LOWER	52	2.59%	0.000106918133525625	
	HIGHER	46	0.80%	0.000033874692806036	1.7254679#
Q7B	LOWER	52	2.59%	0.000106918133525625	
	HIGHER	50	1.99%	0.000082869727399221	0.5756504

*The estimated proportion of 'yes' responses to the sensitive question are calculated using Equation (11)
** Variance of the sensitive behavior is calculated using Equation (13)

statistically significant at the 0.05 level

TABLE 5.0, indicate a proportion of examination malpractices occurred among students in lower level than students in higher level for malpractices questions, 'On the Examination day, did you ignore your seat and sit beside your friends (2B)' (lower 12.68% and higher 4.37%), 'Did you copy the next person if you forget any question (3B)' (lower 6.74% and higher 2.58%), 'Did you bring in CHIPS to the Examination Hall (4B)' (lower 19.21% and higher 8.53%), 'Did you hire other people to write the Examination through impersonation (5B)' (lower 3.48% and higher 1.10%), 'Did you bring in electronic devices to examination hall and use it when you don't know any question (6B)' (lower 2.59% and 0.80%) %) and 'did invigilators connive with you to cheat in Examination hall in case you forget any question (7B)' (lower 2.59% and 1.99%). The higher proportion of examination malpractice among lower level students may be attribute to the fact that at lower level students are doing some university courses which make the examination hall overcrowded than at higher level where students are only doing their departmental courses. A statistical significant difference was found between students in lower level and higher level for all the questions except Q7B. Students in lower level exhibit higher proportion of examination malpractices than students in higher level at 0.05. H_6 is not supported in the hypothesized direction except for Q7B.

The Sixth Hypothesis: AGE

The alternative hypothesis for the sixth hypothesis hypothesized that there is no significant age difference among students towards examination malpractices. The result summarized in Table 6.0

Table: 6.0 AGE and EXAMINATION MALPRACTICES (RRT)

TYPE OF EXAMINATION MALPRACTICES	LEVEL	No. of Responses	Proportion of Examination Malpractices *	Variance**	Z-Scores
Q2B	LOWER	79	10.61%	0.000469931698315173	
	UPPER	65	6.45%	0.000177266907224078	1.90343#
Q3B	LOWER	72	8.53%	0.000266873567900248	
	UPPER	46	0.80%	0.000106918133525625	4.70104#
Q4B	LOWER	97	15.95%	0.000658714081667014	
	UPPER	83	11.79%	0.000330934785216051	1.60022
Q5B	LOWER	49	1.69%	0.000142429353752494	
	UPPER	53	2.88%	0.00004623572924688	-0.9933
Q6B	LOWER	48	1.40%	0.000106918133525625	
	UPPER	50	1.99%	0.000033874692806036 3	-0.5687
Q7B	LOWER	53	2.88%	0.000106918133525625	
	UPPER	49	1.70%	0.000082869727399221 7	1.13178

*The estimated proportion of 'yes' responses to the sensitive question are calculated using Equation (11)
** Variance of the sensitive behavior is calculated using Equation (13)

statistically significant at the 0.05 level

Table 6.0, indicate that higher proportion of examination malpractices occurred among students with lower age than students with higher age for malpractices questions, 'On the Examination day, did you ignore your seat and sit beside your friends (2B)' (lower 10.61% and higher 6.45%), 'Did you copy the next person if you forget any question (3B)' (lower 8.53% and higher 0.80%), 'Did you bring in CHIPS to the Examination Hall (4B)' (lower 15.95% and higher 11.79%), 'Did you hire other people to write the Examination through impersonation (5B)' (lower 1.69% and higher 2.88%), 'Did you bring in electronic devices to examination hall and use it when you don't know any question (6B)' (lower 1.40% and 1.99%) %) and 'did invigilators connive with you to cheat in Examination hall in case you forget any question (7B)' (lower 2.88% and 1.70%). A statistical significant difference was found between students in lower age and higher age for questions 2B and 3B. Age difference was not significant for Question 4B, 5B, 6B and 7B. Students in lower age exhibit higher proportion of examination malpractices than students in higher age

Conclusion

The RR technique was effective in reducing non-response bias, but its effectiveness in reducing response bias could not be established statistically.

Some relationships were found between the demographic variables examined and examination malpractices. The association of the demographic variables and examination malpractices confirmed some new trends found in examination malpractices research, such as male students involve in examination malpractices than female students. And students in lower level exhibit a higher proportion of examination malpractices than students in higher level. However, interpretation of the survey results was restricted by lack of statistical significance of the differences in hypotheses testing.

There are several ways to improve the efficiency of the design and hence the significance of the results. The first consideration is the type of RR technique chosen, as some RR Techniques are more efficient than others [6]. The RR technique used in this study (unrelated Question with a known distribution) is one of the most efficient RR designs, as it uses a known distribution for the non-sensitive question, leaving only the sensitive attribute to be estimated [6].

The second consideration is the choice of parameters used in operating the RR Technique, since this can affect the efficiency of the estimates, particularly the choice of p (the Probability of answering the sensitive question) and π_u (the known distribution for the non-sensitive question). The choice of parameters and their relationship to the sampling variance of the estimators are discussed in the research design section. The general rule is that the closer p is to 1 and π_u is to zero, the greater the efficiency of the design. However, the jeopardy to the respondents also must be taken into consideration [6]. The jeopardy level of the RR design cannot be ignored for the sake of efficiency, as this would be a refutation of whole reasoning behind using a RR technique. The tradeoff between efficiency and jeopardy is the dilemma of using the RR technique and presents no easy solution. Researchers must either deal with the increased inefficiency of the estimates affecting the significance of the results or, if choosing an overly efficient RR design, run the risk of respondents refusing to participate due to high levels of respondent jeopardy [6]. As noted earlier, with the benefits of hindsight, we found that the known probability for the non-sensitive question we used was too high. The large π_u we used substantially inflated the sampling variances of the sensitive estimators.

Another consideration is the sample size and the response rate. Sample size is constrained by Limited availability of resources. Higher response rates produce smaller variances of the estimates, and this will increase the efficiency. Low response rates are a concern for most surveys,

addressing sensitive issues [6]. We expected to increase response rate by using the RR technique. Unfortunately, we found that ordinary people receiving a RR technique survey instrument might find the instructions difficult to comprehend, and even when the instructions were comprehensible, they still might have difficulties in appreciating the usefulness of the survey results. Furthermore, when the RR technique is used, the respondents inevitably have to spend more time to read and follow the instructions. All these factors contribute to the low response rate. Thus, it is a challenge to researchers to write clear RR instructions which are easy to comprehend and follow, and are able to convince the respondents that the procedure will protect their privacy, yet also provide useful data for the researchers [6]. In this study, the data analysis was restricted to univariate analysis. The extension of the RR technique to multivariate analysis is yet to be explored in this work. Future examination research using the RR technique may consider using multivariate analyses to test more sophisticated theories of examination malpractices.

APPENDIX

All responses are anonymous and will be kept strictly confidential

If you have not written any examination as an Undergraduate student in Federal University of Technology, Akure, please pass on this questionnaire to someone else who has written at least one exam has an undergraduate student in FUTA. If you don't see any undergraduate student, kindly tick 'No' in question 1, then answer questions 8 to 16.

1. Are you an undergraduate student in FUTA (please tick one box)

Yes	☐	Please answer all questions in section I, II and III
No	☐	Please answer all questions in section II and III only

SECTION I

In this section we would like to ask some potentially sensitive questions about your last exams in FUTA, but we don't want to put you on the spot, so we are using a procedure that makes it safe for you to respond truthfully to each question without anyone ever knowing which question you actually answered

First, take a bank note from your wallet or purse and look at the last three digits of the serial number on the bank note. (If you don't have a bank note handy, please use the LAST three digits of your telephone number.) Do not make any note of these numbers on the questionnaire.

We will ask six pairs of questions on the next page. You answer only one question in each pair, depending on the serial number on the bank note, **which only you know**. We will not know which question in the pair you answered; we will only be able to statistically draw some conclusions about all the respondents as a group.

2. If the LAST digit of your bank note's number is 1, 2, or 3, answer question 2A. Otherwise, answer question 2B

2A. Is the LAST digit of the serial number an even Number?	**Your answer to 2A or 2B is:** (please tick one box)
2B. On the examination day, did you intentionally Ignore your normal seat and sit beside your Friends?	☐ YES ☐ NO

3. If the SECOND LAST digit of your bank note's number is 1, 2, or 3, answer question 3A. Otherwise answer question 3B

3A. Is the SECOND LAST digit of the serial number an even number?	**Your answer to 3A or 3b is:** (Please tick one box)
3B. did you intentionally copy the next person If you forget any question?	☐ YES ☐ NO

4. If the THIRD LAST digit of your bank note's number is 1, 2, or 3, answer question 4A. Otherwise answer question 4B.

4A. Is the THIRD LAST digit of the serial number an even Number?	your answer to 4A or 4B is: (Please tick one box)
4B. Did you intentionally bring in CHIPS to the examination Hall?	☐ YES ☐ NO

5. Similarly, if the LAST digit of your bank note's number is 1, 2, or 3, answer question 5A. Otherwise, answer question 5B

5A. Is the LAST digit of the serial number an even Number?	Your answer to 5A or 5B is: (please tick one box)
5B. Did you intentionally hire other people to write the Examination through impersonation?	☐ YES ☐ NO

6. If the SECOND LAST digit of your bank note's number is 1, 2, or 3, answer question 6A. Otherwise answer question 6B

6A. Is the SECOND LAST digit of the serial number an even number?	**Your answer to 6A or 6b is:** (Please tick one box)
6B. did you intentionally bring in electronic devices To examination hall and use it when you don't Know any question?	☐ YES ☐ NO

7. If the THIRD LAST digit of your bank note's number is 1, 2, or 3, answer question 7A. Otherwise answer question 7B.

7A. Is the THIRD LAST digit of the serial number an even Number?	**your answer to 7A or 7B is**: (Please tick one box)
7B. did invigilators connive with you to cheat in Examination hall in case you forget any Question?	☐ YES ☐ NO

SECTION II

Please complete the following background information which will help us prepare a profile of the respondents.

8. How old are you? (please tick one box)

☐ Under 18 years of age
☐ 18 – 22
☐ 23 – 25
☐ 26 – 30
☐ Over 30 years of age

9. Are you male or female? (please tick one box)

☐ Male
☐ Female

10. Which of the following best describes your SCHOOL? (Please tick one box)

☐ SOS
☐ SET
☐ SEET
☐ SEMS
☐ SMAT
☐ SAAT

11. Which of these describes your level? (Pleases tick one box)

☐ 100Level
☐ 200Level
☐ 300Level
☐ 400Level

☐ 500Level

12. What is your present C.G.P.A? (Please tick one box)

☐ Below 1.00

☐ 1.00 – 2.49

☐ 2.50 – 3.49

☐ 3.50 – 4.49

☐ Above 4.50

SECTION III

Please indicate the extent of your agreement or disagreement with the following statements by CIRCLING a number to help us evaluate the questionnaire we use.

		Strong agree	agree	Neither agree nor disagree	disagree	Strongly disagree
13	All of the questions and instructions were clear in their meaning	1	2	3	4	5
14	I felt that my privacy was protected by anonymity of my response	1	2	3	4	5
15	I understood the method of selecting which question in a pair to answer using the serial number on a bank note	1	2	3	4	5
16	I felt that my privacy was further protected by the procedure used in question 2 to 7	1	2	3	4	5

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