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Handling of Non-Response Error by Agricultural Education Post-Graduate Students in Eswatini

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Abstract

It is always difficult to collect data from all members of an identified target population, especially with larger and more diverse samples. Thus, a need exists to address non-response error in surveys; to obtain conclusions that are precise and less erroneous. Thus, the study sought to describe the manner in which Agricultural Education post-graduate students deal with non-response error in Eswatini. The design of the study was content analysis; employing desk review in data collection. The content analysis protocol was peer reviewed by three colleagues from the Department of Agricultural Education and Extension, at the University of Eswatini. Data analysis was performed using frequencies and percentages. Findings of the study revealed that in a majority of the theses all the questionnaires were returned. However, in cases where the questionnaires were not all returned; the students neither reported nor indicated how they dealt with the non-response error. Therefore, the study concluded that students had challenges in dealing with none-response error. Consequently, the study recommended that a need exists to capacitate and require the students to report and deal with non-response error. A further study should be conducted to establish the challenges surrounding the reporting, and dealing with non-response error by the master's degree students in agricultural education.

Keywords: Agricultural Education; handling non-response; non-response error; post-graduate students; University of Eswatini.

1. Introduction

Reference [1] advocated that numerous improvements must be made in research, such as using appropriate research methods and techniques. Among the techniques used in research is handling non-response error. Failure to handle non-response in a study results in non-response error [2]. Non-response error is one of the five types of errors that are associated with survey research, namely: measurement error, population frame error, sampling error, selection error, and frame error [3, 4]. Non-response exists when respondents included in the sample fail to provide usable responses [5, 6]. It refers to the discrepancy between the group approached to complete a survey and those who eventually provide data [7].

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Thus, non-response errors occur when the survey fails to get a response to one or possibly all the questions [7]. It is rare to collect data from all the members of the identified sample, especially with larger and more diverse samples (achieve a perfect response rate – 100%) despite good intentions and the efforts researchers may exert [7].

There are two types of non-response: unit non-response and item non-response. The unit non-response also known as total non-response is the failure to obtain information from a member of the sample as a unit whereas item non-response is the failure to obtain full data from respondents – respondents provide some but not all or the reported information is not usable [8]. Unit non-response can occur due to respondent refusal, no contact and inability to participate. On the other hand, item non-response can occur because of interview interruption, refusal, skipping the question, and respondent does not know the answer [8].

Nonresponse error can be divided into two categories: non-contacts and refusals [9]. Non-contact error is when mailed surveys do not reach the potential subjects while refusal error is when surveys may have reached the potential subject, but were not returned [10]. Reference [9] stated that non-contact error occurs due to the following reasons: (i) insufficient postage, (ii) incorrect mailing address, (iii) bulk mail delay or non-delivery by post office, or (iv) interception and disposal of mail by a family member or significant others. Singer [9] further presented the following reasons for refusal to occur: (i) no return address provided, (ii) no postage-paid return envelope provided, (iii) unclear survey instructions, (iv) survey too long or complicated, (v) mistrust of confidentiality, and (vi) lack of interest. In addition, Reference [11] noted that non-location error is the third cause for non-response. This is the failure to locate a sample unit at a particular wave of a panel survey.

Reference [10] identified the following as mailed survey problems affecting the response rate: incorrect social title salutation; remaining expense not included in budget; human error while stuffing envelopes; letter folder/inserter machines get sequence out of order; incorrect address is used; commercial pricing - junk mail look alike; capitalisation of address databases; incorrect mailing list is provided; mail sent to a deceased person; and mailing is discarded by post office. Reference [8] presented that item non-response may occur because: (i) a sample unit may refuse or be unable to answer a particular question; (ii) the interviewer may either fail to ask the question or to record the answer; or (iii) a record is inconsistent - does not satisfy an editing check. Similarly, Reference [12] argued that item non-response was caused by inadequate comprehension of the intent of the question, judged failure to retrieve adequate information, and lack of willingness or motivation to disclose the information. Individuals gave the following reasons for unit non-response: they did not receive the mail; they were too busy; they forgot it or lost it; they were not interested in the topic; the survey was too long; or they thought it was not intended for them [13]. Reference [14] presented that unit non-response was due to non-delivery of survey request, refusal (environmental, personal and survey approach related factors), and inability to provide the requested data.

Non-response has two effects on data. Firstly, it reduces the sample size and, thus, decreases the precision with which results or findings can be stated. Secondly, it introduces error into the sampling process by excluding a non-random subset of the population [7]. If the excluded subset is different from those remaining with regard to the survey data, the findings of the survey will be biased. Recruiting sufficient numbers to compensate for

expected refusals and statistical techniques can be used to combat these effects. The responses if provided may be different from those received on the basis of the respondents' characteristics of interest in the study [5]. Thus, there is a need to deal with non-response. The purpose of non-response adjustment is to reduce nonresponse biases while preserving the precision of the estimate [15].

The literature presents several strategies for preventing or minimising non-response error in survey research. Cocchi, Giovinazzi, and Lynn [16] argued that non-response could be minimized by accounting for national variation, sub-grouping based on similar characteristics, improving co-operation, such as using incentives, choosing an effective survey mode and strategies, e.g. web versus face-to-face surveys, and having refreshment sample to replace drop outs. Reference [10] cited the length and content of the questionnaire, incentives, number of contacts, appearance, and the delivery process as means of preventing non-response in survey research. The best known strategies to increase response rates are incentives and mode of contact such as number, timing, intervals, and manner [15]. Reference [4] suggested that survey response can be maximised by: (i) establishing the respondent's trust; (ii) increasing the expected rewards of participation; and (iii) reducing the social costs of participation. In addition, researchers may choose to use alternative methods such as telephone interviews [7], may choose to use multiple methods in soliciting response [18] or may provide incentives to those invited to participate [7].

Reference [18] observed that the best way of dealing with non-response error is to try to avoid it. This involves using repeated callbacks on telephone or sending reminders to the respondents. The researcher can use introductory letters or statements at the beginning of questionnaires describing the purpose of the survey, provide information on who is funding and conducting the survey, stress the importance of the person's responses to the survey, and assuring the respondent that all survey responses will be kept confidential. Similarly, Reference [2] asserted that appropriate action should be taken such as follow-up procedures to prevent non-response.

Reference [18] stated that if the non-response could not be avoided then, the first step in dealing with non-response is to conduct exploratory data analysis on the survey data. For unit non-response, after determining the overall non-response rate one should then consider response rates by other variables that are available for both responding and non-responding units. For item non-response, one should start by determining how much non-response is there for each variable. For key study variables, one should consider summaries of other variables according to whether or not the key variable is missing. The problem of item non-response can be solved by: (i) deleting records with missing items; (ii) publishing the missing items as unknown, putting them as one category; (iii) adjusting each estimate by ignoring the records with relevant missing items in each case; or (iv) filling in plausible and consistent values for the missing items [8].

Similarly, Reference [15] purported that if non-response could not be avoided post-survey adjustment techniques such as imputation and weighting method. The imputation method involves the replacement of missing values by the mean of the variable to impute or by values forecast in a regression. The weighting method involves the proportional distribution of the population among the groups such as sex, age, and education so that the auxiliary variables are distributed as in the whole population. Reference [2] presented five

methods for controlling non-response error: (i) ignore non-respondents; (ii) compare respondents to population; (iii) compare respondents to non-respondents; (iv) compare early to late respondents; and (v) "double-dip" non-respondents i.e. 10-20% of the non-response is randomly drawn to be interviewed. Similarly, Reference [7] reported that the following strategies for dealing with non-response were used: ignoring non response; limiting survey conclusions to the population studied; assessing and correcting for sampling bias due to non-response; and adjusting for sampling bias due to non-response. The ability of social science researchers to draw conclusions, generalise results or findings, and make inferences to broader audiences is enhanced by the use of these techniques [19].

Reference [19] suggested that if, after appropriate follow-up procedures are made, a response rate of less than 80% was achieved: a random sample of 20 non-respondents should be contacted ("double-dipped"). Responses should then be compared with each item of the instrument to determine if non-response error is a problem. Reference [20] noted that if, after appropriate follow-up procedures have been carried out, a response rate of less than 75% was achieved: the researcher should attempt to describe how respondents might differ from non-respondents by comparing characteristics of respondents to those of the population, comparing early to late respondents, or comparing respondents to a small random sample of non-respondents. Similarly, Reference [21] recommended that

"*if fewer than about 80% of people who receive the questionnaire complete and return it, the researcher must try to reach a portion of the non-respondents and obtain some data from them. Additional returns of all or critical portions of the questionnaire by 5 to 10% of the non-respondents is required for this purpose*" (p. 267).

Comparison is made between the data of early respondents and late respondents to check if there is a significant difference. If the difference is significant, the findings of the study cannot be generalised, otherwise, the findings of the study should be generalised to the data sample [2, 6].

The following authors after attempts to achieve 100% response rate from the respondents failed, handled non-response in different ways. Reference [22] conducted a telephone follow-up survey of 22% of the non-respondents using the entire instrument. Reference [23] compared faculty with the population on known characteristics. Reference [24] randomly selected a sample of 20 non-responding subjects and were contacted by telephone. Connors and Elliot [26] grouped data as early or late respondents and then compared their responses to the numerical rating scale questions using t-tests. However, Reference [27] did not conduct planned telephone follow up of non-respondents since a 97.8% response rate was considered adequate [25].

In an attempt to find out how researchers handle non-response in social science research, Reference [5] reported that the average response rate was 81.6% [the minimum response rate reported was 28%, and the maximum was 100%]. The study revealed that some of the studies not achieving 100% response rate could not even indicate the threat posed by non-response (n=75, 24.7%). About half of the articles having non-response rate (n=100, 46.7%) did not make any attempt to control non-response error. Thirty percent of the studies controlled non-response error by comparing early to late respondents and almost 20% of the studies attempted to control for non-response error by following up with non-respondents. Above 2% of the studies (2.3%, n=5) controlled non-

response error by comparing respondents and non-respondents on characteristics known *a priori* and almost 1% of the studies (0.9%, n= 2) controlled non-response error by comparing respondents to population on characteristics known *a priori*. Seventy-five percent of the articles published indicated that there were no differences between respondents and non-respondents; thus non-response error was not a threat to external validity. Almost 20% of the articles did not report results of efforts to control for non-response errors. Approximately 6% of the articles (n=7) found differences between early and late respondents or respondents and non-respondents. Interestingly, the findings of four of the articles where differences were found were generalised to the target population. Only the findings of three of the articles where differences were found were limited to the sample.

2. Purpose and objectives

The purpose of the study was to describe the manner in which Agricultural Education post-graduate students deal with non-response error in Eswatini. The objectives of the study were to:

1. identify methods used to get study participants or respondents for Agricultural Education post-graduate students research
2. identify the sampling methods used in Agricultural Education post-graduate students' theses.
3. describe the extent to which the Agricultural Education post-graduate students report response rate.
4. identify the methods used by the Agricultural Education post-graduate students to control non-response error.

3. Methodology

This was a desk review research employing content analysis in data collection in January 2018. A census of master's degree students' theses (n=60) in Agricultural Education from 1996 to 2017 in the University of Eswatini were used. A content analysis guide was used to solicit data from the master's degree students' theses relating to non-response error. The content analysis protocol was peer reviewed by five educators (n=5) from the Department of Agricultural Education and Extension of the University of Eswatini and two teacher training college lecturers. The protocol had four portions: whether sampling method or census was used, sampling method used, response rate, reporting non-response, and handling non-response error. Data were collected from January to March 2018. The researcher was granted permission by the Senior Librarian at Luyengo Campus in the University of Eswatini to use a special room to peruse the theses. Data were analysed using frequencies and percentages.

4. Findings and discussions of the study

4.1. Methods used to select study participants or respondents

The content analysis depicts that most of the theses for Agricultural Education graduates reached the respondents or participants through sampling (n=39, 65.0%) instead of a census (n=21, 35.0%) (see Figure 1). The findings of the study reiterate those that exist in the body of knowledge or literature. For instance, Linder,

Reference [5,17] found that most of the studies in agricultural education used sampling instead of a census.

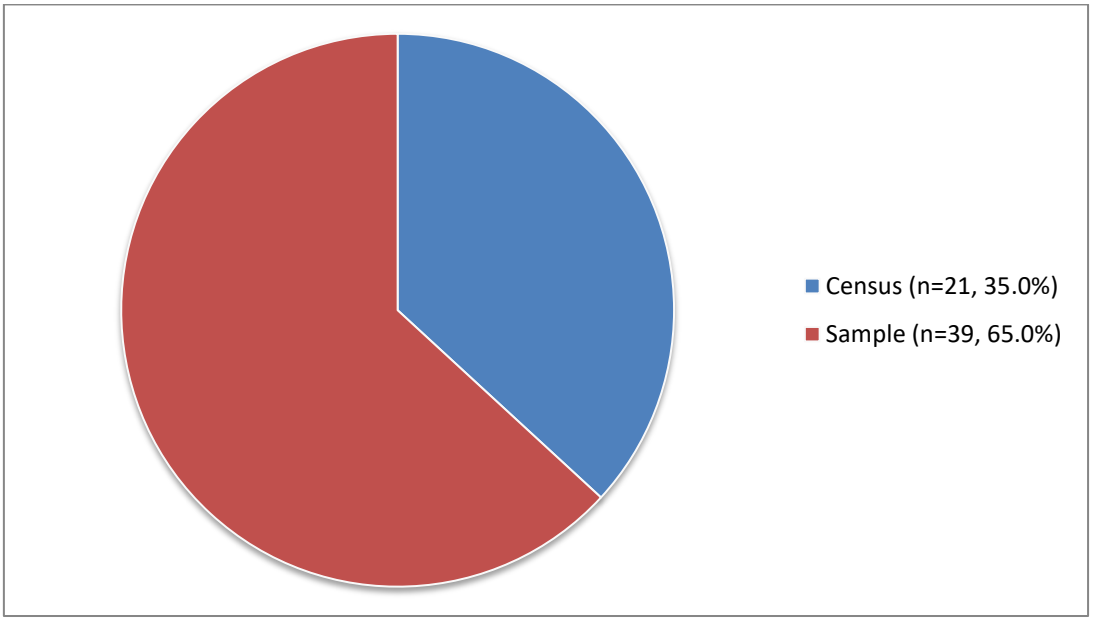

Figure 1: Group studied by Agricultural Education masters' degree graduates.

4.2. Methods of sampling used

Table 1 depicts that purposive sampling was the most commonly used method of sampling. Perhaps, this is because most of the theses used a mixed method approach and various methods of sampling were used in the quantitative strand while the purposive sampling method was used in the qualitative strand. Stratified random sampling (n=15, 23.8%) and simple random sampling (n=13, 20.6%) were the most probabilistic sampling methods used. Linder, Murphy and Briers [5] reported that simple random and stratified random sampling methods were the most commonly used in Agricultural Education. However, Reference [17] found that convenient and purposive sampling methods were commonly used in agricultural extension studies.

Table 1: Sampling designs used in Agricultural Education post-graduates' theses.

Type of research	f	%
Simple random	13	20.6
Stratified random	15	23.8
Systematic random	2	3.17
Cluster random	3	4.76
Purposive / Judgemental	27	42.9
Accidental or Convenience	2	3.17
Snowballing	1	1.59

4.3. Reporting Non-response Error

Table 2 presents the data on non-response error in Agricultural Education master's degree theses. In a majority of the theses, all the questionnaires were returned (n=23, 37.7%) %); that is, they achieved 100% response rate. In 12 theses, non-response error was reported and handled (n=12, 21.3%). Ten master's degree students avoided

reporting non-response while nine Master's degree students (15%) reported non- response but did not indicate how it was handled. Strategies for preventing non-response from the literature include accounting for national variation, sub-grouping based on similar characteristics, improving co-operation such as using incentives, choosing an effective survey modes and strategies e.g. web versus face-to-face surveys, and having refreshment for the sample to replace drop outs [16]. Reference [10] argued that length and content of the questionnaire, incentives, and number of contacts, appearance, and the delivery process also prevent non-response in survey research. Reference [2] asserted that appropriate action should be taken; such as follow-up procedures to prevent non-response.

Reference [5] found that most articles in agricultural education reported non-response as a threat to external validity. However, Reference [17] found that most researchers did not even mention non-response in agricultural extension studies. Reference [5] further revealed that some of the studies not achieving 100% response rate did not indicate the threat posed by non-response. About half of the articles having non-response rate did not make any attempt to control non-response error.

Table 2: Reporting Non-response Error in Agricultural Education master's Theses (N=62).

Reporting non response error	f	%
All returned	23	37.7
Reported and handled	13	21.3
Not reported	12	19.7
Reported but not handled	9	14.8
Not applicable	5	8.2

NB: Multiple responses possible

4.4 Method of controlling non-response error

Table 3 presents the data on methods used by Agricultural Education master's degree students to handle non-response error in the theses. Most of the master's degree students handled non-response error by comparing early to late respondents. However, the master's degree students were generally not specific on how the comparison of early respondents to late respondents was done (n=8, 44.4%). Two theses controlled non-response error by comparing the early and the late respondents using t-test. Other master's degree students opted to ignore non-response (n=7, 38.9%). Studies that ignored non-response had taken preventative measures such as: over-sampling to cater for non-respondents, while other students (n=2, 11.1%) made follow-up visits until all questionnaires were returned. In two theses, prior arrangement were made, such as organising a venue whereby the respondents filled the questionnaires in the presence of the researcher in order to prevent or minimise non-response. Similarly, some master's degree students used follow-ups or revisiting the respondents to control non-response. Again, most agricultural education articles did not indicate methods used in handling non-response error [5] while none was reported by [17] in agricultural education studies to have dealt with non-response error.

Table 3: Handling Non-response Error in Agricultural Education Masters Theses (N=18).

Handling methods	f	%
Compared early respondents to late respondents	8	44.4
Ignored	7	38.9
Follow-up on unreturned questionnaires	2	11.1
Over-sampling	1	5.6

The content analysis also revealed that a majority of the master's degree students in Agricultural Education had 100% response rate, thus, non-response error was not a threat. However, some master's degree students whose studies could not yield a 100% response rate; neither reported it nor handled it. Most of the individuals who reported and handled it used comparison of early to late respondents. Unfortunately, they did not state how these respondents were compared. The findings were consistent with those from Connors and Elliot [26] who grouped data as early or late respondents and then compared their responses to the numerical rating scale questions using a t-test. Similarly, Reference [5] reported that 30% of the studies controlled non-response error by comparing early to late respondents. Reference [22] dealt with non-respondents making a telephone follow-up survey of 22% of the non-respondents. Reference [23] compared faculty with the population on known characteristics. [24] randomly selected a sample of 20 non-responding subjects and were contacted by telephone. However, Reference [27] did not conduct the planned telephone follow-up of non-respondents since a 97.8% response rate was considered adequate [25]. Reference [5] reported that 20% of the studies attempted to control for non-response error by following up with non-respondents. The following are common means to deal with non-response in survey research: conduct exploratory data analysis, determining the overall non-response rate, determining how much non-response is there for each variable, deleting records with missing items, publishing the missing items as unknown, putting them as one category, adjusting each estimate by ignoring the records with relevant missing items in each case; or filling in plausible and consistent values for the missing items [8, 28]. Reference [18] purported that the best way to deal with non-response error is to try to avoid it. This involves using repeated callbacks on telephone or sending reminders to the respondents, using introductory letter, providing information on source of funds for the survey, stressing the importance of the person's responses to the survey, and assuring respondents of confidentiality. Comparing early respondents to late respondents is the most commonly used method of handling non-response error. This situation presents the need to consider the other methods of handling non-response, such as double-dipping, comparing respondents on known characteristics and so forth.

5. Conclusion and Implications

The study concluded that the research methodologies used by the post-graduate students when sampling from the population was mainly purposive sampling method. Some of the master's degree students could not provide a comprehensive documentation of response rate and handling of non- response error; consequently, the researcher concluded that the master's degree students were generally challenged regarding reporting and controlling non-response error. Some of the Master's degree students went to the extent of over-sampling or making all humanly possible efforts to get back the questionnaire, perhaps to avoid the challenges of reporting and handling non-response error.

The findings imply that the aspect of non-response error is not receiving the attention it deserves in Agricultural Education. Both the students and theses supervisors have not handled issues related to non-response error judiciously. It can further be implied that students have challenges in handling issues related to non-response error. If such attitude persists the standard and quality of research will be compromised. Therefore, there is a need to heed to the call by [1] that numerous improvements must be made in research, such as using appropriate research methods and techniques. Dealing with non-response is definitely one of the techniques that must be improved in Agricultural Education.

6. Recommendations

There is a need to capacitate and require the students to report and deal with non-response error. There is a need to challenge the post-graduate students to use advanced statistical means of handling non-response error such as the weighting and imputation methods since none of these post-graduate theses reported the exercise to that extent. Further in-depth study is necessary to unearth the challenges on preventing, reporting, and dealing with non-response error by the master's degree agricultural education students in Eswatini. Another study on the other types of errors: measurement error, sampling error, selection error, and population frame error is necessary. On another note, students should be encouraged to use even the other types of probabilistic sampling methods as most of them are fond of the purposive sampling. Furthermore, students should be advised to indicate the type of purposive sampling used since there are many.

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