

Use of Validity, Suitability and Reliability in Post-Graduate Agricultural Education Research in Eswatini

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Abstract

Validity, suitability and reliability are essential techniques to ensure that research results or findings are authentic, truthful, credible, or believable, yet, there is scanty empirical research conducted on these research techniques. In Eswatini, there is no study that has been conducted on research validity, suitability and reliability. Therefore, the study sought to determine the use of validity, suitability and reliability by post-graduate Agricultural Education students in Eswatini. The design of the study was content analysis employing desk review in data collection. The content analysis protocol was peer reviewed by five colleagues from the Department of Agricultural Education and Extension, at the University of Eswatini. Descriptive statistics using frequencies and percentages, and narrative analysis were used in data analysis. Findings of the study revealed that the master's degree students in Agricultural Education were addressing issues related to validity and reliability; but not suitability. The students were also found wanting in doing a pilot study in quantitative research; and trustworthiness in qualitative research. The study concluded that the students were trained to address issues of measurement error more in quantitative than qualitative research. The researcher recommended that the master's degree programme must capacitate the students in face validity, suitability and pilot study.

Keywords: Agricultural Education; post-graduate; reliability; suitability; validity.

1. Introduction

Shortcomings evident in social science research propelled Norman [1] to encourage researchers to improve the criteria, standards, and level of rigour for scholarship. Reference [2] recommended that numerous improvements must be made in research, such as using appropriate research methods and techniques. Validity and reliability are some of the techniques used in research; especially quantitative research. These are research instrumentation techniques associated with measurement; thus, quantitative researchers are mainly concerned with measurement [3].

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Measurement is the assigning of numbers to observations in order to quantify phenomena [4]. It is a distinct step in the research process that occurs prior to data collection. It involves the operation to construct variables, and the development and application of instruments or tests to quantify these variables [5]. Any deviation from the true value of the aspect being measured results in measurement error. Measurement error is the difference between the true or actual value and the measured value [4]. Reference [4] further stated that the true value is the average of the infinite number of measurements, and the measured value is the precise value. Measurement error does not only affect the ability to find significant results but also can damage the function of scores to prepare good research. Reference [6] mentioned that measurement errors occur in research because of the following: i) gross errors – due to human error, ii) systematic error – due to measuring device, and iii) random error – due to changes. Gross error could be addressed by the researcher being careful while systematic error and random error could be addressed using validity and reliability respectively.

Validity and reliability are the two most important and fundamental features in the evaluation of any measurement instrument or tool for a good research [4]. They assist in establishing the truthfulness, credibility, or believability of findings [7] (Neuman, 2014). Similarly, Reference [4] stated that the purpose of establishing reliability and validity in research is essentially to ensure that data are sound and replicable, and the results or findings are accurate. Validity and reliability ensure that the researcher uses items that are valid, reliable, and unambiguous to the research subjects [8]. Validity and reliability in quantitative research reveal two strands: whether the result is replicable and whether the means of measurement are accurate and measuring what they are intended to measure [9].

Validity is the extent to which any measuring instrument measures what it is intended or purported to measure [10]. It is the degree to which the results or findings are truthful; thus, it requires the research instrument to correctly measure the concepts under the study [11]. Validity determines whether the research truly measures that which it was intended to measure or how truthful the research results or findings are [12]. Validity can be broadly considered as internal, and external. Internal validity is concerned with replicability of the results or findings while external validity is concerned with applicability or generalisability of the findings or results to a different setting [13]. Validity is mainly divided into four types: content validity, face validity, construct validity, and criterion-related validity [14, 11]. Content validity is the extent to which a measurement instruments items are relevant and representative of the target construct. Face validity is the extent to which a measurement instrument's items linguistically and analytically look like what is supposed to be measured. Construct validity measures the extent to which different constructs diverge or minimally correlate with one another. Criterion validity can either be concurrent or predictive. Concurrent validity measures the extent to which items simultaneously relate to another measure that it is supposed to relate while the predictive validity is the extent that a measure predicts another measure [15].

On the other hand, reliability refers to the degree to which the results or findings obtained by a measurement and procedure can be replicated [16]. It is the consistency, stability and repeatability of results or findings, over identical situations but different circumstances [17]. Embodied in the concept of reliability is the idea of replicability or repeatability of results or observations [12]. Reliability is used to evaluate the stability of measures administered at different times to the same individuals and the equivalence of sets of items from the

same test [5]. The higher the reliability is; the more accurate the results or findings; thus, increasing the chance of making correct decision in research. It is measured using reliability coefficients. Reliability coefficients range from 0.00 to 1.00 [either negative or positive], with higher coefficients indicating higher levels of reliability [18]. The general rule is that reliability coefficients greater than 0.8 are considered as high [19]. In educational research, much attention is placed on internal consistency using split-half, item-total correlations, Kuder-Richardson-20, Kuder-Richardson 21, and Cronbach's Alpha [20].

The types of reliability are test and re-test, internal consistency and inter-rater reliability. The test-retest reliability refers to the stability of measures administered at different times to the same individuals or using the same standard. Internal consistency reliability refers to the equivalence of sets of items from the same test. Inter-rater reliability is scoring a behaviour or event of different observers using the same instrument [4]. Reference [21] identified three types of reliability referred to in quantitative research: (i) the degree to which a measurement, given repeatedly, remains the same; (ii) the stability of a measurement over time; and (iii) the similarity of measurements within a given time period.

Suitability is another technique used in the instrumentation process of a survey. It is also known as usability or readability. In fact, some researchers consider usability as a form of validity. Usability seeks to ensure that the respondents can read, understand, and respond to the instrument and technique. Unlike validity that is addressed by a panel of experts; suitability is addressed by field-testing the instrument. Field testing is used to determine the suitability, or utility or clarity of the instrument. Field testing the instrument involves taking the instrument to a target group so that they can consider the language used and the clarity of the items; if they are at the level of the respondents [22].

In Eswatini, numerous studies have been conducted on undergraduate students' research. However, none of these studies has concentrated on the issues of validity and reliability. Moreover, most of these have been targeting undergraduate students' research but not post-graduate research. A study that sought to summarise students' agricultural education dissertations completed between 1991 and 1995 at the University of Swaziland - Faculty of Agriculture found that under-graduate students did not address issues related to validity and reliability [23]. Another study on a synthesis of the students Agricultural Education and Extension dissertations (1985-1990) reported that theses completed from 1985 to 1987 did not address issues related to validity and reliability whereas those completed later (1988 to 1990), addressed issues of validity and reliability [24]. Reference [24] also revealed that Kuder-Rechardson 21 was used in calculating the reliability coefficient. The researcher observed that probably addressing issues relating to validity and reliability at UNESWA, Department of AEE started in 1988. However, the report from [23] contradicts the presentation of [24] on when exactly the discipline began to address validity and reliability.

2. Purpose and objectives

The purpose of the study was to determine the use of validity, suitability and reliability by post-graduate Agricultural Education students in Eswatini. The objectives of the study were to:

1. ascertain the use of validity by post-graduate Agricultural Education students in Eswatini.
2. describe the use of reliability by post-graduate Agricultural Education students in Eswatini.
3. find out the use of suitability by post-graduate Agricultural Education students in Eswatini.

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 validity, suitability, and reliability.

The content analysis protocol was peer reviewed by five colleagues of educators (n=5) from the Department of Agricultural Education and Extension of the University of Eswatini. The protocol had three sections: validity, reliability and suitability. Under the validity section, the researcher observed if validity was addressed using yes or no check boxes. If yes, then four check boxes were provided to indicate the type of validity.

These types were content, construct, face, and others. Under the reliability section, the researcher observed if reliability was addressed using yes or no check boxes.

If yes, the type of reliability was established using check boxes. The check boxes were used to establish the statistics employed in calculating the reliability.

The last section was on whether the graduate students addressed issues of suitability or not. A space was provided in each section for comments on the content analysis protocol. Data were collected from January to March 2018. The researcher was granted permission by Senior Librarian to use a special room to peruse the theses in the library at Luyengo Campus. Data were analysed using frequencies and percentages. Comments were narrated during the presentation of the findings.

4. Findings of the study

4.1. Validity

4.1.1. Ensuring validity in the theses

Figure 1 depicts that validity was ensured in all the theses of master's degree students in Agricultural Education as long as it was applicable (n=58, 96.7%). Validity was not ensured only in two theses because it was not applicable as they were qualitative. However, in qualitative studies, validity is ensured in terms of credibility and transferability. Credibility is parallel to internal validity, while transferability is parallel to external validity [25].

Unfortunately, the master's degree students in the theses that were qualitative did not address the issues of credibility and transferability.

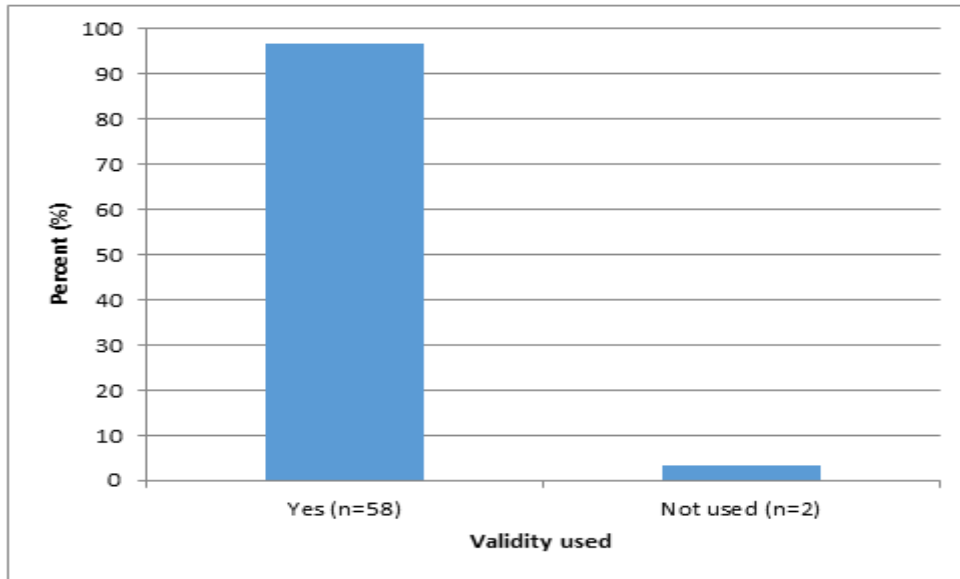


Figure 1: Use of validity in Agricultural Education master's degree theses.

4.1.2. Types of validity

Figure 2 presents the types of validity used by the master's degree students in the theses. Almost all the master's degree students (n=57, 95%) ensured content validity and 39 students (65%) ensured face validity in the theses. Only one thesis (1.7%) addressed construct validity. Generally, master's degree students in Agricultural Education addressed the content and face validity.

However, some master's degree students did not address face validity even though they were expected to do so. Confusions were rampant as to how face validity should be addressed in terms of the picture in the instrument. Some master's degree students indicated that they used a panel of experts whereas others indicated that they were the ones ensuring face validity by inserting an appropriate picture depicting the content or subject.

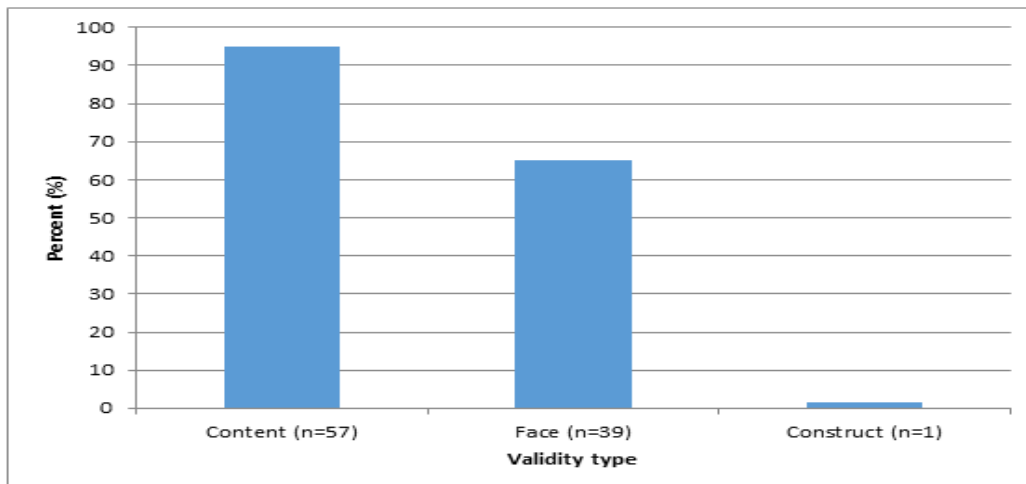


Figure 2: Type of validity used in the Agricultural Education master's degree theses.

NB: Multiple responses is possible

4.2. Reliability

4.2.1. Use of reliability in the theses

Figure 3 depicts that reliability was ensured in all the theses of master's degree students in Agricultural Education in the theses where it was applicable (n=56, 93.3%). Reliability was not calculated only in four theses because it was not applicable as they were qualitative. However, in qualitative studies, reliability is ensured in terms of dependability, such as providing full details on research design and data generation [25], which these students did not do.

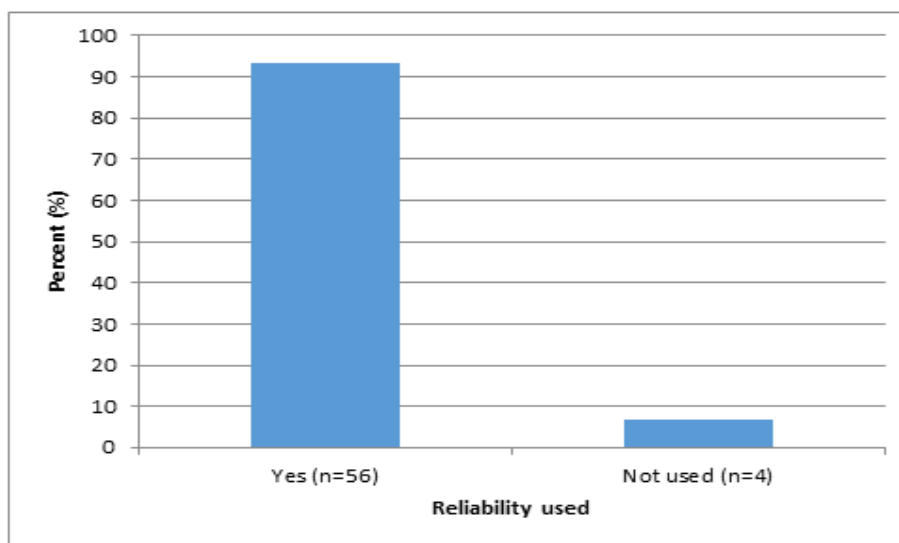


Figure 3: Use of reliability testing in the Agricultural Education master's degree theses.

4.2.2. Types of reliability

Generally, the master's degree students in Agricultural Education used the inter-item reliability from a pilot study. However, some graduates did the pilot study on a group that was different from the target group, yet reliability has to be conducted on a similar or same group. For instance, one study was pilot-tested on agriculture teachers yet the study was targeting leaders in the subject. Another study was piloted on fifth year students from the university and farmers; yet the study targeted farmers. Another observation was that the master's degree students used various sample sizes for the pilot study. The sample sizes ranged from 10 to 60 respondents. One of the theses reported that the same respondents were used for the pilot and actual study, yet, this may have contamination effect on the actual study. Only one graduate used a test and re-test reliability. Unfortunately, it was not clear how this reliability was established. Another study employed numerators to assist in data collection but did not indicate or report the inter-rater reliability coefficient. It is note reported if the numerators received any training.

4.2.3. Reliability statistics

Figure 4 presents the statistics used by the master’s degree students to calculate reliability in the theses. An overwhelming majority of the master’s degree students (n=49, 90.7%) used Cronbach’s Alpha. Three master’s degree students (n=5.6%) used Kuder Richardson 21 (KR-21) while two master’s degree students (3.7%) used Kuder Richardson 20 (KR-20). Perhaps, most master’s degree students used Cronbach’s Alpha because it combines both KR-20 and KR-21. Also, Cronbach Alpha can be easily calculated using SPSS.

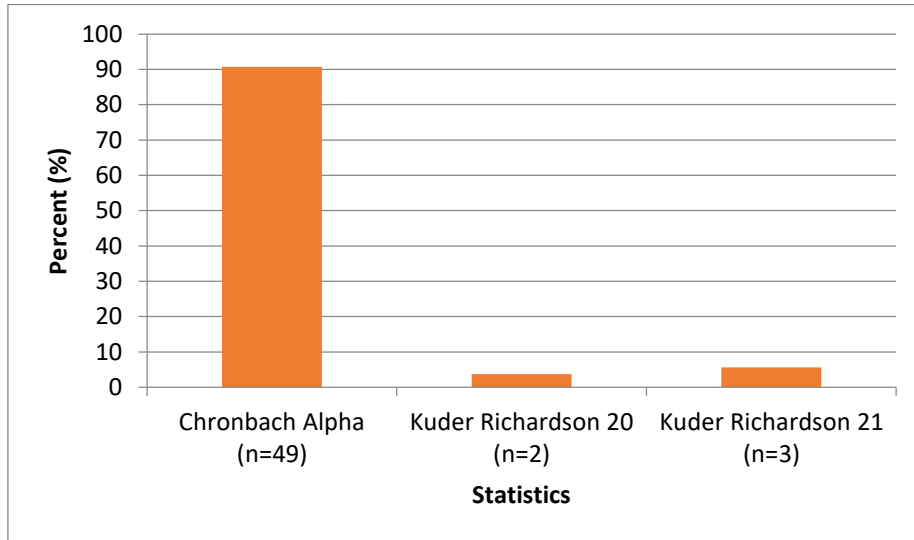


Figure 4: Reliability statistics used in the Agricultural Education master’s degree theses.

4.3. Suitability testing

Figure 5 reveals that a disappointing majority of the master’s degree students in Agricultural Education (n=49, 81.7%) did not address issues of suitability in the theses. It was speculated that the graduates assumed that the suitability was addressed under validity. Only six master’s degree students (n=6, 10.0%) ensured suitability in the theses. Suitability helps to ensure that the instruments are appropriate to the level of the respondents.

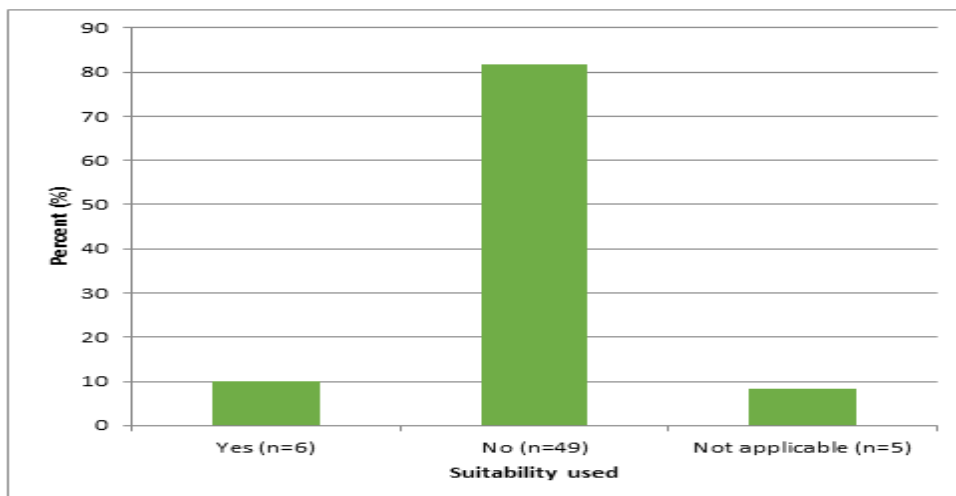


Figure 5: Use of suitability testing in Agricultural Education Master’s degree theses.

5. Discussions

The findings show an improvement from what was reported by previous researchers regarding validity and reliability. A study that sought to summarise students' Agricultural Education dissertation completed from 1991 to 1995 in the University of Eswatini - Faculty of Agriculture, found that undergraduate students did not address issues related to validity and reliability [23]. Another study on a synthesis of the students' Agricultural Education and Extension dissertation (1985-1990) reported that theses completed from 1985 to 1987 did not address issues related to validity and reliability whereas those completed later (1988 to 1990), addressed issues of validity and reliability [24]. Reference [24] also revealed that Kuder-Rechardson 21 was used in calculating the reliability coefficient. The researcher observed that probably addressing issues relating to validity and reliability at UNESWA, Department of AEE started in 1988. However, the report of [23] contradicts the presentation by Shabangu [24] on when exactly the discipline began to address validity and reliability

6. Conclusions and implication

The researcher concluded that validity and reliability were addressed in the theses for master's degree students in Agricultural Education. The students were exceptional in addressing the content validity. Another conclusion drawn was that the students did not know the means of addressing trustworthiness (validity and reliability) in qualitative studies. This is because none of the qualitative studies explained how trustworthiness was addressed in the studies. The students are also confused as to how face validity should be addressed. Suitability was not addressed in most of the theses for the master's degree students in Agricultural Education. Inter-item reliability is the popular type of reliability for Agricultural Education post-graduate student in Eswatini. Even though the students used a pilot study to address issues related reliability, there are grey areas regarding the number of respondents in the pilot study. A confusion exists as to who should be in the pilot study in reference to the actual study. Chronbach's Alpha is the most popular method used to calculate the inter-item reliability coefficient in the theses. The master's degree students did not know how face validity for an instrument is ensured. The findings imply that master's degree students in Agricultural Education are more into quantitative research than qualitative research. This is evident from the fact that they did very well in addressing validity and reliability in quantitative research and dismally in addressing trustworthiness in qualitative research. Also, an overwhelming majority of the theses were quantitative. There are existing grey areas in the literature regarding face validity and pilot study. For instance, the students were not clear on how they should address face validity. They were also not clear on the number of respondents that constitute a pilot study. A careful analysis revealed that even the literature is inconsistent on these aspects of instrumentation in research. Researchers do not address suitability in their studies probably because it is misconstrued to be validity.

7. Recommendations

The study recommends that the course in research method taken by the master's degree students must be fortified or augmented with strategies for establishing face validity and suitability. The students need to be empowered on issues related to pilot study. Further assistance is necessary to empower the master's degree students on addressing issues related to validity and reliability (trustworthiness) in qualitative research.

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