Innovations

Research Integrity among Early Career Researchers in Public Universities. Any Hope for Reproducibility in Nigeria with Mentorship Practices?

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Abstract

Problem :*The rate at which research is falsified, data is fabricated, and works are plagiarised is alarming, especially in Nigeria, where the incentive for research is low. Previous studies have focused on other factors, like institutional variables, that influence research integrity. Yet, attention has not been paid to mentorship practices with their sub variables on research integrity, and this is the gap that this study covered.* ***Methodology :*** *The study adopted an expost facto research design with a census approach to select 675 Ph.D. students. The Mentorship Practices and Research Integrity Scale (MPRIS) questionnaire was used for data collection. The instrument had a high validity and reliability index established using experts and the Cronbach alpha method. Simple and multiple linear regressions were used for data analysis.* ***Findings:*** *Findings revealed that cloning, nurturing, and apprenticeship relatively and collectively contribute to ECR's research integrity. The proportion of variance explained by each of the variables, though not high, was significant for each variable.* ***Conclusion/implication:*** *The study has provided empirical evidence that mentorship practices are crucial contributors to research integrity. The result can provide policymakers with a proper understanding of the practices that can help early-career researchers develop standard procedures for research activities.*

Key words: *Mentorship practices , cloning , nurturing , apprenticeship and research integrity*

Introduction

The importance of research in any society cannot be overemphasised because it is the pivot around which societal innovations and inventions revolve. The findings from research are so important that they provide opportunities for solving societal problems as well as improving existing knowledge. Thus, the practices that revolve around it must follow rules and standard procedures to discover the truth. However, experience over the years has shown that many early-career researchers do not maintain standard procedures in the conduct of their research work. This accounts for a lot of activities that produce questionable results in their research efforts.

There are numerous cases of questionable research practices and misconduct. That is, research fabrications, falsifications, or plagiarism in studies or reporting research results have been alarming (Steneck, 2006). Responsible research ensures that due process in a standard pattern is followed in order to fulfil professional responsibilities. Research integrity is the ability of researchers to adhere to the highest professional standards in carrying out research. It is the ability of researchers to ensure that what is carried out in the name of research is done with the hope of enhancing reproducibility, dependability, and trustworthiness(Steneck 2006). It is responsible conduct that ensures that systematic processes are maintained in the discovery of truth. Researchers have maintained that research misconduct is more than just falsification, fabrication of data, and plagiarism; it includes other forms such as lack of proper data management, lack of confidentiality, inability to get informed consent, inappropriate authorship, and withholding of research findings (Bouter et al. 2016; Buljan et al. 2018). More so, there are still no identified practices that are universally accepted as detrimental research practices, which has led to different opinions on what constitutes research misconduct (Ravn & Srensen, 2021; Resnik et al., 2015). Over the years, there have been a series of reports on cases that bordered on falsification of data and fabrication of reports, among others (see Azakir et al., 2020; Shahnazarian et al., 2017; Jones, 2002). In Africa, it was reported that 32 papers were identified that had cases of plagiarism, errors in data, fabrication, falsification, and a lack of institutional review board approval (Kombe et al. 2014). More so, data have shown that countries like Nigeria and Tunisia have no institutional system that spells out conditions for managing research misconduct (Azakir et al., 2020).

Researchers have tried to identify factors that promote a lack of integrity among researchers. For example, factors such as lack of knowledge of research practices, financial issues, work pressure, family or relationship issues, institutional demands, lack of research facilities, cost of research, and availability of facilities have been identified to promote research misconduct (Davis & Riske 2002; Satalkar & Shaw 2019). This situation has raised a lot of attention among researchers, given that it will be detrimental to society if certain decisions are carried out based on the findings that were erroneously obtained. In fact, Rea et al. (2022) have maintained that researchers, funding organizations, the government, and scientific publishers have a role to play in maintaining standards and integrity in research. Therefore, given the importance of research findings to the scientific community, it is imperative that the variables that promote research integrity be understood(Sohrabi et al., 2021).

Similarly, the research engagement of early career researchers (measurement and evaluation students) must be based on sound scientific principles since so much is required of them in the production of findings, validation of instruments, conceptualization, and methodological arrangements of studies. Thus, research focusing on these categories of students is gaining attention in the literature (Merga & Mason, 2021a, 2021b; Bégin-Caouette et al., 2020). Thus, the study on the contribution of mentorship to research integrity among early-career researchers is essential for the acquisition of skills, techniques, and knowledge needed for future psychometricians, which this study is poised to achieve. The study is aimed at revealing findings that will inversely help scholars help their students acquire the skills that will enhance quality research outcomes and produce results that may be reproducible.

This study is anchored on the weak tie theory as proposed by Granovetter (1973). The theorist posited that individuals connecting with others in a group can benefit from relevant information that can enhance their academic activities more than when working as individuals in a smaller group. When these occur, the relationship that they have becomes more professional, insightful, and helpful for individuals to acquire skills like team spirit and knowledge sharing skills, which may not be available when working alone. Thus, measurement and evaluation students, who are often described as early-career researchers, will become close to their mentors, have close ties, and are more disposed to benefit from their wealth of experience. The implication of this theory for the study is that when mentors and mentees have a close relationship, both can benefit on a short- and long-term basis. The productivity of the mentors will increase, and the mentees must have learned the standard procedure and the rigour that are required for producing a standard work that will stand the test of time. More so, the mentees must have also had their names in papers that are collaboratively published in highly ranked journals, as well as benefit from other research grants that may be won by their mentors. The main purpose of the study is therefore to examine the relative and joint contribution of mentorship practices to the research integrity of early-career researchers in the area of measurement and evolution at six universities.

Literature review

There are different studies that have considered the factors that influence research integrity (Anderson et al., 2007a). Several studies have identified factors such as training (Goldman et al., 2021; Poppelaars et al., 2022), attitude to research (Nicholas et al., 2020), and poor research culture (Christian et al., 2021). However, with special attention to mentorship among early career researchers, some studies have focused on factors such as mentors experience (Mgaiwa & Kapinga, 2021), information mentorship (Al Shebli et al., 2020), online mentorship (Bielczyk et al., 2019), induction and mentorship programmes (Weldon, 2018), and research mentorship (Hernandez-Lee & Pieroway, 2018). However, these studies have not focused on areas of mentorship such as cloning, nurturing, and apprenticeship as specific practices of mentorship that are worth examining.

Most studies that have been on mentorship have focused largely on how it influences research productivity (Okon et al., 2022). For instance, Melissa et al. (2007) carried out another study on mentoring and training on responsible conduct of research, and the result showed that mentoring is significantly related to low engagement in problematic research behaviour. In a related study carried out by Oluwasanu et al. (2019), the result showed that Nigerian researchers could not operate as an interdisciplinary team due to a lack of qualified researchers within. Daniel and Kris (2022) study showed that reverse mentoring and collaboration between mentors and junior researchers mitigate the imbalance that sometimes affects early-career researchers and PhD candidates research activities. Gibson et al. (2020) noted that positive mentoring experiences are linked with ‘‘research productivity, career satisfaction, and research success’’.

Jung's (2014) study in Korea also showed that research productivity was based on academic fields. However, these findings do not provide information on how each of the mentoring practices contributes to research integrity, which is the focus of the study. Luchuo et al.'s (2022) results showed that funding and improving the mentoring system enhance research integrity in sub-haram. Africa The study of Hilmer and Hilmer (2007) showed that a difference exists between early career researchers who are assigned to competent researchers and those who have mentors who are not productive in research. This study's findings suggest that students who are under the tutelage of a productive researcher who is identified as working according to rules will abide by the principles and ethics that govern research activities. The quality of the research output of these students will be quite different, and issues of reproducibility as identified will be reduced or eliminated completely. It is therefore not out of place to state that students

who learn under mentors who ensure that standards are followed will inculcate those virtues to avoid falsification and fabrication.

However, it is assumed that mentorship influences the quality of research output that is often produced among early-career researchers. Yet few studies have empirically looked in this direction. In fact, to date, the researchers are not aware if any study exists that models the relationship between mentorship and its various sibling variables (cloning, nurturing, and apprenticeship). Although Melissa et al. (2007) revealed that mentorship has a positive relationship with research integrity, this one study is inadequate to lay a complete claim on the contributive effect of mentorship for a global research academic community to make conclusive claims. Similarly, the study does not provide any additional information on the area of discipline. It is imperative that additional studies be carried out to clarify this claim. Other studies have also recommended that similar studies be carried out with other mentorship practices that may encourage research integrity (see Prozesky et al., 2021; Marini et al., 2019). The current study is mostly concerned with early-career researchers in educational measurement and evaluation since they have observed some misnomers in most publications. Thus, three core areas are identified for promoting research integrity. The current study also focuses on early-career researchers in this area since they constitute the foundation of future research in Nigeria and are valuable in assessing other research studies.

Method/participants

The study adopts a quantitative method with ex post facto design as its approach. The study was carried out in the South-South geopolitical zone in Nigeria with six states, which are Cross River, Akwa Ibom, Delta, Bayelsa, Rivers, and Edo State. The area has 22 public universities and 15 private universities. The cost facto was found to have relevance since information is obtained from what has already occurred.

The study was made up of all Ph.D. students at 15 universities that offer Educational Measurement and Evaluation as a professional discipline. Early-career researchers in this context are those students in their doctorate degree programmes from the 15 universities in the study area. The population of early career students in the 15 universities is 675. The nature of the population warranted the use of a consensus approach since it is not large and the researchers can comfortably manage all members of the population. The demographic characteristics of the respondents showed that 382 (representing 56.59%) were males, while 293 (representing 43.41%) were females. In terms of age, 278 (representing 41.19%) were below 30 years old, 201 (29.78%) were between 30-45 years old, and 196 (29.04%) were above 45 years old. More so, in terms of marital status, 197 (29.19%) are single, 309 (45.78%) are married, and 169 (25.04%) belong to any other category. For occupation, 89 (13.19%) are farmers, 179 (26.52%) are traders/business, 307 (45.48%) are civil servants, and 100 (14.81%) are grouped as others. (See Table 1).

Instrumentation

A questionnaire titled Mentorship Practices and Research Integrity Scale (MPRIS) was the instrument designed for data collection. The instrument was designed based on the knowledge of the researchers and a review of the literature. The instrument was divided into sections. The section was designed to elicit demographic information about the respondents, such as age, gender, marital status, and occupation. Section B was designed to elicit information on mentorship practices. There are three variables, such as cloning (cloning is an activity that is carried out by mentors with the aim of ensuring that early-career researchers are professionally similar to them). They inculcate the same characteristics as they do. This variable was measured with six items to ascertain how they perceived the cloning practices of their supervisors and mentors. Nurturing (the ability of scholars or mentors to develop in the mentees the

skills and knowledge required for better research and academic careers but not necessary to be replicated in them as done in cloning) was measured using eight items and apprenticeship (this is more practical and experiential in nature as the ECR learned from the mentor through observation, hands-on). Thus, the ECR is always present during the research practices and sees what is done in order to get perfected at any time, and it was measured with eight items also. In Section B, a total of 22 items were used, and the response option was a five-point Likert scale that ranged from very strongly agreeing to very strongly disagreeing.

Section C of the instrument consists of 13 items aimed at assessing adherence to the practices that constitute research integrity as established at the end of the conference in Singapore (see Resnik & Shamoo, 2011). These key areas include adherence to regulations, appropriate research methods, maintenance of research records, exact reporting of research findings, publication of the right authorship, publication acknowledgement, peer review adherence, conflict of interest declaration, public communication, reporting irresponsible research practices, responding to irresponsible research practices, maximising research environments, and societal considerations. These items were stated in an impersonal form in order to allow the respondents to provide their objective responses using a four-point scale of very often (VO), often (O), sometimes (S), and never (N).

Validation

The quantitative validation of the content was carried out using seven experts in psychology, sociology, measurement and evaluation. These experts are professors with the widest experience in their professional area. Thus, four were taken from psychology and sociology, while three were taken from measurement and evaluation. The item scoring was done using three criteria, which are relevance, clarity, and representativeness. Item content validity index (I-CVI) and scale content validity index (S-CVI) were used. The findings from the validation showed that first, the item content validity index (I-CVI) for the mentoring practices has the following values: relevance (0.83-0.88), clarity (0.87-0.94), and representativeness (0.87-0.91). For research integrity, the I-CVI for relevance of items ranged from 0.81-0.90; for clarity of items, it ranged from 0.77–0.87; and for representativeness, it ranged from 0.80-0.85. However, the Scale Content Validity Index (S-CVI) for the mentoring practices has 0.85-0.91 (relevance), 0.80-093 (clarity), and representativeness (0.88-0.96). Researchers have noted that the criteria for determining the Item Content Validity Index (I-CVI) are that for two experts, the CVI must be at least 0.80; where three to five experts are involved, it should be at least 0.99; where there are six to eight experts, it should range from 0.83; and where it involves 9 to above experts, the least index should be 0.78 (see Polite et al., 2007; Yusoff, 2019). A curious look at the indices obtained for the study shows that they are within the possible range of criteria used for determining content validity: item (content validity index) and scale (content validity index). Thus, the items were retained except for a few that were reworded for more clarity. The reliability of the instrument was further tested using Cronbach's alpha using 50 Ph.D. students in the Southeast Region of Nigeria that were not originally earmarked for the study as a trial-and-error study. The coefficient of each scale was obtained, such as cloning (= 0.87), nurturing (= 0.78), apprenticeship (α = 0.89), and research integrity (= 0.85).

Procedure for data collection

The data collection was done by the researchers with some trained research assistants in various schools that were used for the study. The researchers enjoyed maximum cooperation because they were mostly adults who understood what they were doing and were willing to participate without cohesion. A total of 675 respondents were selected for the study, and only 4 Ph.D. candidates withdrew their participation because of the busy nature of work and studies. These students who were not willing to participate in the study were dropped, and the researchers did not make any effort to coerce any of them to take part in the

study. The researchers were able to get the consent of the participants by providing a form that they signed, indicating that they were involved in the study and that they were aware of what the study sought to achieve. The researchers sought out all the completed questionnaires and were numbered serially to avoided double coding.

Findings

Research question one

What is the relative effect of cloning practices on research integrity among early career researchers in Educational Measurement and Evaluation in public universities ? The result of the analysis as presented in Table 2 showed that the relative contribution of cloning practices to the total variation in research integrity of early career researchers in the field of measurement and evaluation is 9.4% (Adjusted R 2 = .094). This implies that there is other 90.6% unexplained variance that can contribute to this variation other than the identified factors in this model. Similarly , the regression of coefficient (β=0.309) showed that a unit increase in cloning practices of the mentors will lead to 0.30% increase in the research integrity of early career researchers in the field of measurement and evaluation. More so , the result in Table showed that (F=70.479, p=.000). since p value of 0.00 is less that p(.05) at 1 and 669 degrees of freedom, there is a significant contribution of cloning practices on the research integrity of early-career educational measurement and evaluation students in universities. This indicates that the adjusted R^2 value of .094 was not due to chance.

Research question two

What is the relative effect of nurturing practices on research integrity among early career researchers in Educational Measurement and Evaluation in public universities ? The result of the analysis as presented in Table 3 showed that the relative contribution of nurturing practices to the total variation in research integrity of early career researchers in the field of measurement and evaluation is 59.4% (Adjusted R^2 = .594). This implies that there are other 40.6% unexplained variance that can contribute to this variation other than the identified factors in this model. Similarly , the regression of coefficient (β=0.796) showed that a unit increase in nurturing practices of the mentors will lead to 0.80% increase in the research integrity of early career researchers in the field of measurement and evaluation. More so , the result in Table showed that (F=967.798, p=.000). since p value of 0.00 is less that p(.05), there is a significant contribution of nurturing practices on the research integrity of early-career educational measurement and evaluation students in universities. This indicates that the adjusted R^2 value of .594 was not due to chance.

Research question three

What is the relative effect of apprenticeship practices on research integrity among early career researchers in Educational Measurement and Evaluation in public universities ? The result of the analysis as presented in Table 4 showed that the relative contribution of apprenticeship practices to the total variation in research integrity of early career researchers in the field of measurement and evaluation is 10.0% (Adjusted R^2 = .100). This implies that there are other 40.6% unexplained variance that can contribute to this variation other than the identified factors in this model. Similarly , the regression of coefficient (β=0.318) showed that a unit increase in apprenticeship practices of the mentors will lead to 0.32% increase in the research integrity of early career researchers in the field of measurement and evaluation. More so , the result in Table showed that (F=75.355, p=.000). Since p(0.00) is less that p(.05), there is a significant contribution of apprenticeship practices on the research integrity of early-career

educational measurement and evaluation students in universities. This indicates that the adjusted R^2 value of .594 was not due to chance.

Research question 4

What is the composite contribution on mentorship practices(cloning, nurturing and apprenticeship practices) on research integrity of ECR in educational measurement and evaluation in universities? The result of a multiple linear regression analysis, as presented in Table 5, shows that the that Adj. R^2 = .592 which implies that the variation in research integrity could be explained by 59.2% of the contribution of all the variables combined. By implication, there are other variables that are extraneous in the model that can account for 40.8% of the study. More so , a cursory look at the analysis of variance (ANOVA) result showed that (F=322.092, p=.000). Since p(.00) is less than p(.05), we can draw the conclusion that variables of mentorship practices significantly contribute to ECR among educational measurement and Evaluation students in universities. Similarly , a relative check showed that a unit increase in cloning practices of mentors is associated with . 019 unit increase in the ECRs research integrity. The result also showed that a unit increase in the standard deviation of the nurturing practices of established academics contributes about .766 of a unit to the standard deviation of the ECRs' research integrity. It was further predicted that a unit increase in the standard deviation of the apprenticeship practices of established academics contributes about .026 of a unit to the standard deviation of the ECRs' research integrity. Among the three predictors, only the contribution of nurturing practices was significant. However, the contribution of cloning and nurturing practices were not statistically significant in this study. Furthermore , nurturing was the strongest (t = 27.880, p =.000)

Discussion of findings

The first research question result showed that cloning practices contribute to ECR's research integrity. The result showed that closing practices contribute 9.4% to the total variance of research integrity. The explanation for the result could be that when mentors identify students that they want to invest themselves in, they do everything possible to ensure that they teach them the best research practices that will make them a replica of themselves at any time. This, however, is a function of what the senior academics want. They build people that they can be proud of at any time, especially as they may edge out of the system and will be proud to leave a copy of those. They can recommend people who have the skills, values, knowledge, and integrity required for proper conduct in research. Thus, psychometricians and research and evaluation experts may find this practice imperative in building future researchers that will salvage research misconduct in public universities and Nigeria in general. The findings of the study align with previous studies. For example, the study findings collaborate with those of Melissa et al. (2017), whose results showed that mentoring is significantly related to low engagement in problematic research behaviour. The study also aligns with Daniel and Kris (2022) study, which revealed that reverse mentoring and collaboration between mentors and junior researchers mitigate the imbalance that sometimes affects ECR's research activities.

Research question two results showed that nurturing practices contribute to ECR's research integrity. The result showed that nurturing practices contribute 59.4% to the total variance of research integrity. The explanation for the result could be that when mentors develop the heart to bring up a generation of researchers that will follow the requisite standard procedure for research, they expose them to conditions that will trigger their inherent abilities and traits and what is expected of them. This form of mentorship involves providing materials and an environment that can foster a proper attitude towards research, which is lacking in most early-career researchers. The findings collaborate with other studies that have established that nurturing as a mentorship practice relates to research integrity. For example, the study of Luchuo et al. (2022) showed that improving the mentoring system enhances research integrity in Sub-Saharan Africa. The study of Hilmer and Hilmer (2007) showed that a difference exists

between early career researchers who are assigned to competent researchers and those who have mentors who are not productive in research.

The result of research question three also revealed that apprenticeship practices contribute to ECRS research integrity. The result showed that apprenticeship practices contribute 10.0% to the total variance of research integrity among ECRs. The explanation for the result could be that mentors The explanation for the finding could be that providing ECRs with the opportunity to observe what the senior academics, supervisors, and mentors do in terms of data analysis, organisation, and interpretation will further help them carry out similar studies and follow the same procedures, which will reduce the reproducibility crises that are prevalent in research conduct in Nigeria. This result, however, was as anticipated because even in the physical areas where individuals learn trades, those who are close to the master acquire sustainable skills that make them productive and competent in what they do. The ECRs are exposed to areas that keep them developing the best global practices in research that can help them under the guidance of their mentors. These mentorship practices, even though they can be relevant in cloning, offer the mentees the opportunity to go to greater lengths so that they may be more successful than their masters in certain areas. The findings of the study were in line with those of Gibson et al. (2020), who noted that positive mentoring experiences are linked with ''research productivity, career satisfaction, and research success''.

The result of the fourth research question showed that the variables of mentorship, when combined, contribute significantly to research integrity among ECRs. The explanation for the result is that no single strategy will be best to inculcate the necessary skills and behaviours that are required. Olayide et al. (2021) found that mentorship programmes are necessary for improving research integrity as well as the output of ECRs in Sub-Saharan Africa. The findings suggest that inclusive mentorship is necessary for mentees to learn what will be adequate for sustainable research practices. Thus, Okon et al. (2022) noted that it is also possible that individuals may be resistant to cloning, nurturing, or apprenticeship systems, whereas they may be more susceptible to other techniques. The combined approach may also help mentors better address the needs of the different individuals that they mentor''. The findings align with those of Hilmer and Hilmer (2007), whose comparative analysis showed that students who learned under a programme considered low-ranked performed better than students that were tutored under high-ranked programmes. The study findings aligned also with those of Luchuo et al. (2022), whose result showed that funding and improving the mentoring system enhance research integrity in sub-Saharan Africa.

Limitation, implication and future direction of the study

The current study is vital in that it has provided empirical literature to future researchers that will be interested in the study of mentorship and its specific variables on research integrity. The study is also important in that it is the first in the area of Measurement and Evaluation research to identify practices that may help future evaluators carry out studies that will be based on standard ethical practices and procedures in conducting research. Similarly, other researchers that may be interested in individual variables of mentorship such as cloning, nurturing, and apprenticeship and how they influence research practices can find it very verifiable in their understanding of the contribution of the variables. However, like any other study, it is not without limitations. The study scope was limited to the South-South geopolitical zone and only one area of discipline, which is just one zone of the six zones in Nigeria. These pose a challenge for generalising the findings to other areas. It is necessary that other scholars widen the scope of the study in terms of discipline and geographical area to expand the fortifiers of knowledge in literature. of these factors on research integrity among ECRs.

Conclusion and Recommendations

Based on the findings of the study, it was concluded that mentorship practices such as cloning, nurturing, and apprenticeship, when taken individually and collectively, contribute to research integrity among ECRs in the field of educational measurement and evaluation. The study also showed that nurturing is a critical activity in promoting research integrity when taken with other variables. It was therefore recommended that inclusive mentorship be practiced in order to raise researchers who will follow strict and standard procedures that are worthwhile and can enhance the reproducibility of studies. Senior academics should identify ECRs that they can comfortably mentor in order to acquire the skills needed for standard practice in the conduct of ethically based research.

Declarations

Author contributions Ofem, Ovat and Nworgwuugwu, Undies and Anyim: Conceptualization, instrumentation design, data analysis, interpretation of results. Amalu, Achi, Anake, Ekpang, Ify , Okpechi and Cyril: Review of literature , data collection and draft manuscript preparation.

Conflicts of interest

No conflict of interest.

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Ethical approval

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Data availability statement

Data is available on request.

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Table 1 Population distribution of respondents

S/N	Variables	Categories	N	Percentage
1	Gender	Male	382	56.59%
		Female	293	43.41%
		Total	675	100.00
2	Age	Below 30yrs	278	41.19%
		30-45yrs	201	29.78%
		Above 45yrs	196	29.03%
		Total	675	100.0
3	Marital status	Single	197	29.19%
		Married	309	45.78%
		Divorced/others	169	25.03%
		Total	675	100.0
4	Occupation	Farmer	89	13.19%
		Business	179	26.52%
		Civil servants	307	45.48%
		Others	100	14.81%
		Total	675	100.0

Table 2 : Simple linear regression analysis of the contribution of cloning practices on research integrity among ECR in educational measurement and evaluation

Model	*SS*	*df*	*MS*	*F*	*Sig*	*Other parameters*
Regression	311.217	1	311.217			
Residual	2954.110	669	4.416	70.479	.000[b]	R=.309[a;] R^2=.095 Adj R^2 =.094; Std Error = 2.10136 ; β=.309; t=8.395*
Total	3265.326	670				

a. Dependent Variable: Research Integrity

b. Predictors: (Constant), Cloning practices

Table 3: Simple linear regression analysis of the contribution of nurturing practices on research integrity among ECR in educational measurement and evaluation

Model	*SS*	*df*	*MS*	*F*	*Sig*	*Other parameters*
Regression	1930.707	1	1930.707			R=.769[a] R^2=.594 Adj R^2 =.594; Std Error = 1.41243; β= .769; t=31.109*
Residual	1334.620	669	1.995	967.798	.000[b]	
Total	3265.326	670				

a. Dependent Variable: Research Integrity

b. Predictors: (Constant), Cloning practices

Table 4: Simple linear regression analysis of the contribution of apprenticeship practices on research integrity among ECR in educational measurement and evaluation

Model	*SS*	*df*	*MS*	*F*	*Sig*	*Other parameters*
Regression	330.565	1	330.565			R= .318[a] ; R^2=.101; Adj R^2 =.100; Std Error = 1.41243; β= .318; t=8.681*
Residual	2934.762	669	4.387	75.355	.000[b]	
Total	3265.326	670				

a. Dependent Variable: Research Integrity

b. Predictors: (Constant), Cloning practices

Table 5: Multiple linear regression analysis of the contribution of mentorship practices on research integrity among ECRs

Model	SS	df	MS	F	Sig.	Other parameters
Regression	1931.826	3	643.942			R= .769[a] ; R^2=.592; Adj
Residual	1333.501	667	1.999	322.092	.000[b]	R^2 =.590;
Total	3265.326	670				
Model	B	SE	β	t-val	Sig	
(Constant)	18.559	.338		54.957	.000	
Cloning	-.010	.019	-.019	-.532	.595	
Nurturing	.441	.016	.766	27.880*	.000	
Apprenticeship	.017	.023	.026	.745	.457	