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Absolute Electronic Assessments and Corrections Adoption for Students' Happiness: Crucial Elements of Economic and Forest Conservation

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ABSTRACT: Electronic assessments and corrections (EAC) of assignments, continuous assessments, and projects over type-printed versions stimulate students' happiness owing to its economic and forest conservation components. Hence, the objective of this paper was to evaluate the crucial elements of economic and forest conservation by adopting absolute electronic assessments over typed-and-printed paper submissions (TPPS) for corrections in a Faculty of Agriculture at a Tertiary Institution in Rivers State, Nigeria, by collecting data from 188 500L using a Google Form questionnaire. The happiness index was determined using the Cantril Ladder scale as well as appropriate statistical tools. The data showed a low average students' happiness index (3.58); however, students in Forestry and Wildlife Management (4.79), Animal Science (4.26), and Fisheries (3.98) showed significantly higher happiness than students in other departments. The estimated economic cost of the printed paper submissions was ₦6,761,354.00 ($4,829.52) per session, compared to ₦370,970.8 ($264.97) for the electronic submissions. Study estimates indicated that participants used 326.55 reams of 80 gm A4-sized paper during their final year session, at an average cost of ₦41.41 ($0.029) per printing page. This is comparable to 741.28 kg of dried pulp, or 20.4 pulp trees. The substantial financial strain students endured on typed-and-printed paper submissions—more importantly, research project corrections have a profound negative impact on their happiness. By phasing out TPPS at the institutions of learning, students' happiness would be enhanced, while considerable economic and forest resources could be conserved.

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While happiness is a crucial index of human liveability, including students' well-being (Tarrahi and Nasirian, 2017; Jiang *et al.*, 2022; Shrotryia and Singh, 2023; Singh *et al.*, 2023), several research and public opinion on the future of the environment are increasingly focusing on the absolute adoption of

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electronic assessments and corrections (EAC), which are crucial indicators of economic and forest conservation worldwide (Osuji, 2012; Iqbal and Ahmed, 2015; Kapuka *et al.*, 2017; Shah *et al.*, 2019; Kosgey, 2020; Schroth and Hody, 2020; Namabira *et al.*, 2022).

EAC is also known as digital assessments, online assessments, on-screen assessments, or computer-based assessments and corrections (Ghouali *et al.*, 2020; Aburumman, 2021). It refers to the use of information technology to assess knowledge, skills, and progress (Dogan *et al*., 2020; Archana *et al.*, 2021). EAC is often presented as a way to overcome the shortcomings of traditional typed-and-printed paper (TPP) assessments (Kosgey, 2020).

Tertiary academic establishments are traditionally heavy users of paper worldwide (Shah *et al.*, 2019), and the entire economic burden of TPP assessments is on the students in Nigeria. One significant indicator of people's temporary, enduring, or permanent happiness is their economic situation (Powdthavee and Stutzer, 2014; Schurer and Yong, 2016; FitzRoy and Nolan, 2022). Students acknowledge the use of TPP assignments for assessments as an enduring economic issue (Donovan *et al.*, 2007), and economic problems have a negative potential impact on human happiness (Powdthavee and Stutzer, 2014). The wide-ranging benefits of promoting students' happiness have led to its recent emergence as a crucial educational priority for educational systems worldwide (Joing *et al.*, 2020). It is seen as a prerequisite for successful learning in the classroom and a necessary product of education for the twenty-first century (Hossain *et al.*, 2023). With the significant rise in economic and forest losses associated with global paper consumption, there have been inadequate research studies exploring more efficient educational assessment techniques that will address these two issues while enhancing students' happiness in Nigeria. Students are one of the most important stakeholder groups in the university setting, and their happiness is of paramount importance (Szegedi *et al.*, 2024). While numerous research studies have been carried out separately on e-assessments and students' happiness in postsecondary educational institutions worldwide (Crews and Curtis, 2011; Sorensen, 2013; Applasamy *et al.*, 2014; Alruwais *et al.*, 2018; Shraım, 2019; Tanti *et al.*, 2021; Gunasekara and Jayasekara, 2021; Javed *et al.*, 2021; Kandi *et al.*, 2021; Laosum, 2023), no study specifically linked e-assessments with students' happiness.

The impact of e-assessment methods on lecturers' happiness was the main emphasis of the study carried out by Namabira *et al.* (2022). Establishing a connection between students' happiness and their e-assignment submissions for evaluations is essential to improving strong economic and forest conservation performance and the responsibilities of the institutions' management. Consequently, the objective of this paper was to evaluate the crucial elements of economic and forest conservation by adopting absolute electronic assessments over typed-and-printed paper submissions (TPPS) for corrections in a Faculty of Agriculture at a Tertiary Institution in Rivers State, Nigeria.

MATERIALS AND METHODS

Study design and participants: Cross-sectional design was used in this study. Selecting participants was done by the complete sampling method. One hundred and eighty-eight final-year students (N = 188) across the six departments in the faculty of agriculture at the University of Port Harcourt, Nigeria, were directly recruited to participate in the study.

Students studying food and nutrition who are not yet in their final year were excluded from our analyses (Table 1). Among the one hundred and eighty-eight participants, 65.4% were within the age groups of 21–25 years, 64.9% females, 94.7% were singles, approximately 40.0% received monthly stipends between ₦21,000 ($15) and ₦40,000 ($28.57), and 48.4% were migrants near (Table 2).

Table I: Distribution of final-year student's population in the faculty of agriculture

Departments	*Number of 500L students*
Agric. Economics and Agribusiness Management (AEA)	40
Agricultural Extension and Development (AED)	29
Animal Science (ANS)	32
Crop and Soil Science (CSS)	34
Fisheries (FSH)	33
Forestry and Wildlife Management (FWM)	20
Food and Nutrition	0
Total	188

Table 2: Demographics of students in the faculty of agriculture, University of Port Harcourt, Nigeria

Characteristics	Categories	Frequency	Percentage
Age	< 21 years	10	5.3
	21-25 years	123	65.4
	26-30 years	52	27.7
	> 30 years	3	1.6
Gender	Female	122	64.9
	Male	66	35.1
Marital Status	Married	10	5.3
	Single	178	94.7
Monthly Stipends	< ₦21,000 ($15)	43	22.9
	₦21,000 ($15) - N40,000 ($28.57)	75	39.9
	₦41,000 ($29.28) - N60,000 ($42.85)	36	19.2
	₦61,000 ($43.57) - N80,000 ($57.14)	23	12.2
	> ₦80,000 ($57.14)	11	5.9
Nativity	Native	74	39.4
	Migrant Near	91	48.4
	Migrant Far	23	12.2

Study tools and data collection: Face-to-face group briefings and carefully designed Google Form questionnaires have been employed as data collection tools. The time frame for this study was November 2023–February 2024. Prior to data collection, the verbal consents of the participants were sought, and the participants were briefed about the objectives of this research. The participants completed well-structured online Google Form questionnaires sent to their respective WhatsApp groups' platforms. All the data were gathered electronically from the filled-out Google Form questionnaires. Based on the estimated financial burden that students faced in comparison to the CA methods that lecturers used, a 10-point Cantril scoring scale ranging from 1 (not at all happy) to 10 (extremely happy) was used to predict students' happiness.

Analysis of data: The statistical analysis was conducted using SPSS version 23. A chi-squared test was performed to interpret the relationship between CA variables and CA methods across the departments. Average and ANOVA were used to interpret students' happiness index categories using a criterion mean of 5.00. Regression analysis was employed to interpret the influences of CA methods and demographics on students' happiness. Means and ANOVA were used to differentiate the economic estimates endured by the students for various CA methods.

RESULTS AND DISCUSSION

CA methods and variables across the departments: The significant disparity in CA methods among departments with respect to CA variables is displayed in Table 3. For term paper submissions, most departments use a primarily paper-based method. Departments like AEA, AED, CSS, FSH, and FWM are notable for using paper-based term paper assessments; in each case, students' answers exceeded 70%.

There was a significant ($p = 0.002$) test of association among ANS students (43.8%) who reported using both paper-based and electronic assessments. With the exception of ANS, which included 50.0% paper-based, 37.5% both paper-based, and 12.5% electronic-based assessments, report assessments were primarily paper-based, with percentage answers ranging from 60.0% (FWM) to 97.5% (AEA). The outcome demonstrated that, in comparison to other departments, ANS and FWM were substantially more related to the use of both paper-based and electronic-based evaluation.

Regarding seminar assessment, a similarly strong relationship was observed. More than 80 percent of participants from AEA, AED, CSS, and Fisheries validated the use of paper-based methods for seminar evaluation. AEA (72.5%), AED (72.4%), and CSS (79.4%) primarily used paper-based methods for project corrections, whereas Fisheries (57.6%) and FWM (50.0%) used a combination of paper-based and electronic-based methods. FWM (30.0%) was the department with the highest response rate ($p < 0.000$) on the electronic-based project assessment.

AEA, AED, and AS use paper-based evaluation, and this association is statistically significant. CSS, FWM, and Fisheries provide online copies of their project pre- and post-field presentations, and they do not use any paper-based assessment (Table 3).

Table 3: Analysis of continuous assessment methods of the various departments

CA variables	*Departments*	*Methods of assessment (Frequency (%))*			χ^2	*Sig.*
		Electronic	*Paper*	*Both*		
Term Paper	AEA	0 (0.0)	36 (90.0)	4 (10.0)	27.220	0.002*
	AED	1 (3.5)	26 (89.7)	2 (6.9)		
	ANS	0 (0.0)	18 (56.3)	14 (43.8)		
	CSS	2 (5.9)	28 (82.4)	4 (11.8)		
	FSH	0 (0.0)	26 (78.8)	7 (21.2)		
	FWM	2 (10.0)	7 (35.0)	11 (55.0)		
	Total	5 (2.7)	141 (75.0)	42 (22.3)		
Report	AEA	0 (0.0)	39 (97.5)	1 (2.5)	38.411	0.000*
	AED	2 (6.9)	26 (89.7)	1 (3.5)		
	ANS	4 (12.5)	16 (50.0)	12 (37.5)		
	CSS	1 (2.9)	30 (88.2)	3 (8.8)		
	FSH	3 (9.1)	28 (84.9)	2 (6.1)		
	FWM	2 (10.0)	12 (60.0)	6 (30.0)		
	Total	12 (6.4)	151 (80.3)	25 (13.3)		
Seminar	AEA	1 (2.5)	33 (82.5)	6 (15.0)	22.512	0.013*
	AED	1 (3.5)	27 (93.1)	1 (3.5)		
	ANS	4 (12.5)	20 (62.5)	8 (25.0)		
	CSS	1 (2.9)	32 (94.1)	1 (2.9)		
	FSH	0 (0.0)	27 (81.8)	6 (18.2)		
	FWM	2 (10.0)	12 (60.0)	6 (30.0)		
	Total	9 (4.8)	151 (80.3)	28 (14.9)		
Project corrections	AEA	2 (5.0)	29 (72.5)	9 (22.5)	48.020	0.000*
	AED	5 (17.2)	21 (72.4)	3 (10.3)		
	ANS	2 (6.3)	15 (46.9)	15 (46.9)		
	CSS	5 (14.7)	27 (79.4)	2 (5.9)		
	FSH	2 (6.1)	12 (36.4)	19 (57.6)		
	FWM	6 (30.0)	4 (20.0)	10 (50.0)		
	Total	22 (11.7)	108 (57.5)	58 (30.9)		
Project Pre/Post field Presentation	AEA	0 (0.0)	40 (100.0)	0 (0.0)	52.120	0.000*
	AED	0 (0.0)	29 (100.0)	0 (0.0)		
	ANS	0 (0.0)	32 (100.0)	0 (0.0)		
	CSS	34 (100.0)	0 (0.0)	0 (0.0)		
	FSH	33 (100.0)	0 (0.0)	0 (0.0)		
	FWL	20 (100.0)	0 (0.0)	0 (0.0)		
	Total	87 (46.3)	101 (53.7)	0 (0.0)		

This study adds to recent literature that has described various CA methods adopted by lecturers in tertiary institutions worldwide (Day *et al.*, 2018; Popkova, 2018; Rawlusyk, 2018; Faremi and Faremi, 2020; Castillo-Manzano *et al.*, 2023; Vahed *et al.*, 2023), with several authors having made efforts to elucidate the relative benefits of these methods (Carrillo-de-la-Peña and Perez, 2012; Hernández, 2012; Blikstad-Balas and Davies, 2017; Holmes, 2018; Day *et al.*, 2019; Makovskaya, 2022; Nancy *et al.*, 2022; Playfoot *et al.*, 2023). In this study, a surprisingly high percentage of CA submissions were typewritten and printed on paper (Table 2), even in the face of the digital revolution or technological advancements. As traditional paper-based processes leave a considerable ecological footprint (Shah *et al.*, 2019; Del Rio *et al.*, 2022), this result shows very little indication of a Nigerian university supporting global sustainability aspirations. The high adoption rate of paper-based methods found in this study is consistent with previous studies by Sopha (2013), Beckline *et al.* (2016), Macaulay *et al.* (2022), and Fredeluces *et al.* (2023) conducted in Nigerian institutions and elsewhere. Adoption of the EAC can be substantial, surpassing submissions through traditional paper-based processes and supporting both economic and forest conservation if there is managerial will. Due to the widespread use of paper-based submissions, educational managers and policymakers have the chance to fulfill their economic and ecological obligations, which will benefit education stakeholders and students while having little to no adverse (or even positive) influence on the forests (Macaulay *et al.*, 2022; Fredeluces *et al.*, 2023).

Happiness index of the participants: All departments were classified in the low happiness group by the criterion mean of 5.00, which was used to categorise happiness into high (above 5.00) and low (5.00 below) happiness. The happiness index was generally low, though FWM, ANS, and FSH significantly had higher happiness scores than the rest of the departments (Table 4). The regression statistics showed that using a combination of paper-based and electronic-based assessments for term papers ($B = 1.006$; $p = 0.013$) has a significant positive influence on student happiness,

while using only paper-based submissions for project assessments and corrections (B = -0.952; p = 0.009) negatively affects students' happiness index (Table 5). None of the predictors (marital status, gender, monthly stipends, and age) significantly predict the happiness index of students, as all p-values are greater than 0.05. The model itself has very little explanatory power, suggesting that there are other factors not included in this analysis that might influence students' happiness. Marital status, monthly stipend, and age have a negative coefficient, suggesting that being married, having a higher income, and being older are associated with a decrease in happiness. Gender has a very small positive coefficient, indicating a minimal increase in the happiness of females compared to males (Table 6). The literature has consistently emphasised the importance of people's happiness (Beus *et al.*, 2011; Duari and Sia, 2013; Uchida and Oishi, 2016; lyukhin and Ilyukhina, 2018; Arora, 2020; Rastelli *et al.*, 2021; Kosztyán *et al.*, 2023; Erus *et al.*, 2024). Research has also been conducted to identify the different factors that contribute to people's happiness (Kim and Kim, 2012; Chen *et al.*, 2019; Bhatia and Mohsin, 2020; Cleofas, 2023), with numerous studies showing that happiness has relevance on higher education (Guazzelli and Zilli, 2016; Short *et al.*, 2020; Bhasin, 2020; Araki, 2022; Alteneiji *et al.*, 2023). In this study, the happiness index of the study population sample was generally low (a mean happiness score of 3.58 on a 10-point happiness scale), and the paper-based submissions for project assessments and corrections were found to be associated with a negative impact (Table 5). Nevertheless, only 22.3% of the participants using both paper and electronic submissions for term paper assessments yielded positive happiness impacts. In 2020, the FWM department, during one of its departmental boards, reached an academic board decision on the complete adoption of electronic pre- and post-field research project seminar presentations. In addition, a decision on the reduction of 16 copies (for sixteen lecturers) of printed paper to just two was equally reached for the seminar course presentation.

These implemented decisions are likely the contributing factors to the highest FWM happiness index found in this study. ANS and FSH with second and third happiness scores might have implemented similar decisions adopted by FWM. This finding is unsurprising. In contrast to term papers, which may permit the copying and pasting of someone's work with a single submission with or without meeting the lecturers, research project execution is more psychologically demanding and necessitates multiple individual student-lecturer meetings in addition to the substantial financial commitment associated with paper-based submissions.

Table 4: Mean happiness index comparison among the departments of the faculty of agriculture, university of Port Harcourt

Departments	*Happiness Index*	*Remark*
AEA	2.78^{c}	Low happiness
AED	2.64^{c}	Low happiness
ANS	4.26^{a}	Low happiness
CSS	3.04^{bc}	Low happiness
FSH	3.98^{ab}	Low happiness
FWM	4.79^{a}	Low happiness
Average	3.58	Low happiness

Means with different alphabets are significantly different at p<0.05; Criterion mean = 5.00

Table 5: Impact of assessment methods of various continuous assessments on students' happiness index

Variables	*Unstandardized Coefficients*		*t*	*Sig.*	R^2	*SEE*
	B	*Std. Error*				
(Constant)	3.731	0.377	9.889	0.000	0.233	1.824
Term paper (Electronic)	0.042	1.071	0.039	0.969		
Term paper (Both)	1.006	0.400	2.513	0.013*		
Report (Electronic)	1.058	0.693	1.526	0.129		
Report (Both)	0.156	0.473	0.330	0.742		
Seminar (Electronic	0.746	0.724	1.030	0.304		
Seminar (Both)	0.160	0.478	0.334	0.739		
Project (Electronic)	0.278	0.510	0.545	0.587		
Project (Paper based)	-0.952	0.360	-2.645	0.009*		

Excluded variables: Term paper (Paper based); Report (Paper based); Seminar (Paper based); Project (Both); R^2 = Coefficient of determination; SEE = Standard Error of the Estimate

Table 6: Impact of demographics on students' happiness index

Variables	*B*	*Std. Error*	*Beta*	*t*	*Sig.*	R^2	*SEE*
(Constant)	3.984	0.775		5.137	0.000	0.019	2.077
Marital Status	-0.717	0.699	-0.078	-1.025	0.307		
Gender	0.063	0.340	0.014	0.184	0.854		
Monthly Stipend	-0.152	0.145	-0.083	-1.046	0.297		
Age	-0.096	0.281	-0.027	-0.342	0.733		

Marital status (Single = 0, Married = 1); Gender (Male = 0; Female = 1)

Academic task meetings with lecturers with repetitive corrections, like in the case of research project execution, have been observed to be students' unfriendly and could be a strong contributing element to their unhappiness. The mean happiness score of 4.906 for young Nigerians under 30 years old, as published by Helliwel *et al.* (2024) on March 20, 2024, during the celebration of World Happiness Day, indicated a higher score than the one discovered in this study. The differences in the predictor(s), young people's classes, and the length of the studies taken into consideration could all be contributing factors to the discrepancy in these results. Additionally, no statistically significant influence on happiness was revealed by the demographic effect analysis. While age, marital status, and monthly stipends all displayed negative coefficients, indicating that these characteristics are associated with lower levels of happiness, gender has a very tiny positive coefficient, indicating that females are happier than males but not statistically significant. Being older, married, and receiving higher stipends are the characteristics that show this association. This finding is consistent with a previous study by Tarrahi and Nasirian (2017), who reported no significant difference in male and female students' average happiness scores in Iranian universities. This finding may be attributed to the near homogeneity or small variations in the analysed demographic characteristics of the participants.

Economic estimations of CA methods: On average, students spent ₦35,964.65 ($25.68) on printed paper submissions, culminating in an astonishing ₦6,761,354.00 ($4,829.52) economic burden (Table 7), compared to ₦370,970.8 ($264.97) for electronic submissions with an average of ₦1,973.25 ($1.40) per final year session (Table 8). The amount of paper utilised during their final year session reached a record of 163278.07 sheets, which is equivalent to 326.55 reams (163278.07 sheets/500) or 741.28 kg given the average weight of a ream of 80 gm A4 size paper is 2.27 kg. This is based on the average cost of ₦41.41 ($0.029) per printed page (Table 7). Despite growing concerns about the risks associated with paper use and its impact on the economy and forest conservation, in addition to the availability of digital facilities, this study revealed the predominant use of traditional typewritten and printed assignment submissions for students' assessments in the faculty of agriculture. A surprising 66.36% of the total CA submissions were based on paper, culminating in an economic loss of ₦6,761,354.00 ($4,829.52). Study estimates indicated that participants used 326.55 reams of 80 gm A4-sized paper during their final year 2020/2023 session. This is comparable to 741.28 kg of dried pulp, or 20.4 pulp-trees (Iqbal and Ahmed, 2015). According to an earlier study by Macaulay *et al*. (2022) in fifty offices of a Nigerian institution, there was a higher consumption of paper (6888 reams) at a cost of around 8 million naira, which translates to a loss of approximately 413 pulp-trees. These figures not only highlight the economic wasteful use of paper in academic settings but also signal significant environmental and forest resource implications (Macaulay *et al.*, 2022). As of today, Nigeria relies on the importation of papers, and Port Harcourt in particular has no visible or functioning paper recycling industry, except occasionally for a few agents coming from Lagos, a city over 500 kilometres from Port Harcourt. Most of the used papers end up in different local enterprises as wrapping materials.

Table 7: Cost of paper-based assessments and corrections in the various departments of the faculty of agriculture

Departments	*Number of Pages*	*Average Price (₦)*	*Total Cost (₦)*	*Cost/Student (₦)*
AEA	36,550	42.75	1,562,512.50	39,062.81[a]
AED	26,500	42.76	1,133,140.00	39,073.79[a]
ANS	25,936	42.81	1,110,320.16	34,697.51[b]
CSS	29,334	41.32	1,212,080.88	35,649.44[b]
FSH	27,088	33.79	915,303.52	27,736.47[c]
FWM	17,890	45.00	805,050.00	40,252.50[a]
Total/average	163,298	41.41	6,761,354.00	35,964.65

Means with different alphabets are significantly different at p<0.05

Table 8: Cost of e-assessments and corrections in the various departments of the faculty of agriculture

Departments	*Number of online Submissions*	*Average Price (₦)*	*Amount (₦)*	*Cost/Student (₦)*
AEA	492	88.65	43,615.80	1,090.40[bc]
AED	356	62.94	22,406.64	772.64[c]
ANS	1140	109.50	124,830.00	3,900.94[ab]
CSS	394	78.33	30,862.02	907.71[bc]
FSH	464	177.08	82,165.12	2,489.85[ab]
FWM	650	123.61	80,346.50	4,017.33[a]
Total/average	3496	106.11	370,970.76	1,973.25

Means with different alphabets are significantly different at p<0.05

Limitations: The first limitation of this work relates to its geographic scope, as it only evaluated a single faculty member at a university in Nigeria. Secondly, this work lacks statistical significance at the national level, even though the sample population complied with the established statistical requirements, making the data acquired significant at the sample level. It should not, therefore, be applied as a normative reference for all Nigerian students. Finally, this study used economic considerations and demographics as predictors, and there are other determinants not included in this analysis that might have an impact on students' happiness. Further studies may investigate these limitations.

Conclusions: This study is distinctive in that it compares students' happiness across the departments in the faculty of agriculture, in a tertiary institution in Nigeria. The findings have revealed the noteworthy financial strain that the students endured, which has a profound impact on their happiness due to their high use of typewritten and printed paper submissions for assignments, seminar works, and research project corrections. This study underscores the necessity of university efforts across the faculties, colleges, institutes, and centres to compulsorily implement policies that can stop the usage of conventional typed-and-printed paper assessments in all academic undertakings such as assignments, seminar works, and research project corrections. The information presented here will form the foundation for future research efforts aimed at adopting comprehensive strategies to phase out traditional typed-and-printed paper assessments in all facets of academic and administrative activities in the universities.

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Data Availability Statement: Data are available upon request from the first author or corresponding author.

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