Journal of Asian Scientific Research
ISSN(e): 2223-1331
ISSN(p): 2226-5724
DOI: 10.55493/5003.v16i1.5891
Vol. 16, No. 1, 373-389.

URL: www.aessweb.com

Knowledge of the faculty researchers on the data and statistical analysis: A case of the SUC from the Region 3

Jennilyn C. Mina[1+]
Jaynelle G. Domingo[2]
Cristo Mark D. Ancheta[3]
Lorinda E. Pascual[4]

[1,2,3,4]*Nueva Ecija University of Science and Technology, Cabanatuan City, Nueva Ecija 3100 Philippines.*
[1]*Email: zedka_jen@yahoo.com*
[2]*Email: jaynelledomingo@gmail.com*
[3]*Email: markcristo14@gmail.com*
[4]*Email: lorindapascual15@gmail.com*


(+ Corresponding author)

Article History
Received: 8 October 2025
Revised: 12 January 2026
Accepted: 30 January 2026
Published: 6 February 2026

Keywords
Challenges
Data analysis
Difficulties
Faculty researchers
Intervening strategies
Knowledge
Policy recommendations
Statistical analysis.

ABSTRACT

This study assessed the knowledge of faculty researchers in a State University in Region 3 regarding data and statistical analysis. It aimed to determine their level of knowledge, identify challenges encountered, and propose strategies for improvement. A descriptive-evaluative research design was used, with 214 faculty researchers selected through random sampling from a population of 480 based on HRMO records as of February 2022. Findings showed that faculty researchers possessed a reasonable level of knowledge, particularly in descriptive statistics and data presentation. However, additional training in advanced statistical tools and techniques was recommended to strengthen their research capabilities. Results also indicated that most faculty members had not taught subjects related to data and statistical analysis, suggesting a gap in instructional and practical expertise. Thus, capacity-building initiatives such as training and professional development were recommended to improve research quality and productivity. No significant differences in knowledge were found across demographic factors such as sex, age, civil status, years in teaching, campus, and college. However, a significant difference emerged in knowledge of statistical tools across fields of specialization, with math and engineering faculty showing higher proficiency. Challenges encountered included limited expertise, insufficient training opportunities, lack of access to statistical software, time constraints, and the complexity of data. To address these issues, the study recommended organizing extensive and consistent seminars, webinars, training sessions, and workshops focusing on data and statistical analysis using appropriate software. These initiatives would enhance competence and enable researchers to utilize statistical tools effectively, supporting informed decision-making and accurate interpretation.

Contribution/ Originality: This study provides a comprehensive understanding of the statistical literacy of NEUST faculty researchers by identifying their knowledge gaps and training needs. The results serve as a foundation for designing targeted capacity-building programs that enhance research competence, promote evidence-based academic practices, and improve research productivity across state universities in Region III.

1. INTRODUCTION

Research capacity among faculty is central to the mission and reputation of higher education institutions. Competent design, analysis, and interpretation of data enable faculty to produce valid, reliable findings that inform teaching, program improvement, and institutional decision-making. Inadequate skills with data processing and statistical methods undermine research quality, limit evidence-based practice, and reduce the likelihood that research outputs will influence policy or practice. In the context of State Universities and Colleges in Region III, strengthening faculty research capacity is particularly important to support regional development priorities and improve institutional research productivity. Yet anecdotal reports and practitioner observations suggest that gaps remain in faculty proficiency with advanced statistical techniques, access to analytic resources, and sustained opportunities for skills development. This study responds to that context by assessing the current level of knowledge of faculty researchers at NEUST in data and statistical analysis, identifying the main challenges they face, and proposing actionable strategies to build capacity. The research fills a local evidence gap by providing institution-specific data on statistical literacy and training needs, and its findings will inform targeted capacity-building programs to elevate research quality and data-driven decision-making across State Universities in Region III.

2. REVIEW OF RELATED LITERATURE

A comprehensive understanding of data and statistical analysis is fundamental to the credibility and quality of research produced in higher education institutions. Faculty researchers play a vital role in advancing institutional research productivity; thus, their competence in handling data and applying appropriate statistical methods is crucial. This section reviews relevant literature on faculty research capacity, statistical literacy, and the common challenges encountered in conducting data analysis. It also examines institutional and contextual factors influencing faculty proficiency and underscores the importance of continuous professional development. The review provides the conceptual foundation for assessing faculty researchers' knowledge in data and statistical analysis within State Universities and Colleges (SUCs) in Region III, Philippines.

2.1. Faculty Research Capacity and Institutional Expectations

Research engagement by faculty is widely recognized as essential to the mission of higher education and to institutional development. Authors have argued that higher education commissions and university governance expect faculty to produce rigorous, credible research that contributes to academic and societal knowledge. These expectations place a premium on faculty competence in research methods and data analysis, which institutions must support through policy, incentives, and capacity-building initiatives [1, 2].

2.2. Role of Data Analysis and Statistical Competence in Research Quality

Data analysis and appropriate statistical application are foundational to valid and reliable research outcomes. Reviews emphasize that researchers must understand both basic descriptive techniques and more advanced inferential methods to draw correct conclusions, assess effect sizes, and test hypotheses. Without these competencies, studies risk errors in interpretation that compromise the credibility and usefulness of findings [3, 4].

2.3. Evidence of Gaps in Faculty Statistical Literacy: International and Local Findings

Empirical studies highlight persistent gaps in statistical knowledge among faculty across contexts. Internationally, research has documented limited exposure to advanced methods and insufficient training opportunities, which negatively affect research outputs [5, 6]. Locally, a Philippine study found that some faculty members lack the necessary knowledge in data and statistical analysis, with measurable impacts on research quality underscoring that these gaps are not confined to any single region or system [7].

2.4. Consequences of Limited Training, Resources, and Access to Software

Scholars have identified several structural and practical barriers that impede faculty competence: limited professional development, restricted access to licensed statistical software, heavy workload and time constraints, and complex data preparation demands. These constraints reduce faculty capacity to adopt advanced techniques and to engage in sustained, high-quality research [8, 9].

2.5. Calls for Targeted Capacity-Building and Institutional Support

The literature converges on targeted solutions: systematic capacity-building programs (workshops, seminars, and hands-on training), institutional investment in analytic resources and software, and the development of mechanisms for consulting and peer support. Researchers stress that interventions should be context-sensitive, continuous, and designed to bridge both foundational and advanced competency gaps [10, 11].

2.6. Summary and Link to Present Study

Taken together, these studies show that (a) statistical literacy is essential for credible research; (b) gaps in faculty competence persist across contexts, including the Philippines; and (c) practical barriers (training, software access, time) frequently constrain improvement. While prior research identifies general patterns and solutions, there is limited institution-specific evidence for State Universities in Region III. The present study addresses this gap by providing empirical data on NEUST faculty researchers' knowledge, the obstacles they face, and tailored recommendations for capacity development within the regional SUC context [12].

2.7. Research Objectives

The main objective of this study is to assess the level of knowledge of faculty researchers at NEUST and to identify the challenges and difficulties they encounter in data and statistical analysis. It also aims to propose intervention strategies and policy recommendations to enhance their understanding of data and statistical analysis.

Specifically, this research seeks to answer the following objectives:

1. To describe the demographic profile of the faculty researchers in terms of:
   - 1.1 Sex.
   - 1.2 Age.
   - 1.3 Civil Status.
   - 1.4 Number of years in teaching.
   - 1.5 Campus and College.
   - 1.6 Field of specialization.
   - 1.7 Subject taught related to data and statistical analysis.
2. To assess the level of knowledge on data and statistical analysis of the faculty researchers in terms of:
   - 2.1 Use and Application of Statistical Tools.
   - 2.2 Data Presentation and Interpretation.
3. To determine the significant difference in the level of knowledge of data and statistical analysis among faculty researchers based on their demographic profile.
4. To identify the challenges and difficulties encountered in conducting data and statistical analysis.
5. To propose intervening strategies and policy recommendations to cope with the challenges and difficulties.

3. METHODOLOGY

This study employed a descriptive-evaluative research design with quantitative analysis to assess the level of knowledge of faculty researchers regarding data and statistical analysis, identify the challenges they encountered, and propose strategies for improvement. The data were collected from faculty researchers of the Nueva Ecija University of Science and Technology (NEUST), a State University and College (SUC) located in Region III, Philippines. NEUST operates multiple campuses, including the Main Campus in Cabanatuan City, Sumacab, Gabaldon, San Isidro, Atate, and Fort Magsaysay, which host various colleges such as the College of Education, College of Engineering, College of Management and Business Technology, College of Arts and Sciences, and the Graduate School.

The total population of faculty researchers was 480, based on the records of the Human Resource Management Office (HRMO) as of February 2022. Faculty researchers were defined as full-time or part-time academic personnel actively engaged in research activities, such as research proposals, completed studies, or ongoing projects. Using the Raosoft online sample size calculator with a 5% margin of error, a sample of 214 respondents was randomly selected to ensure representation across academic ranks, fields of specialization, years of teaching, and campuses.

The primary research instrument was a researcher-made survey questionnaire titled "Survey Questionnaire for Faculty Researchers: Understanding of Data and Statistical Analysis." The questionnaire was divided into three parts. Part I collected demographic information, including sex, age, civil status, years of teaching, campus, college, field of specialization, and subjects taught related to data and statistical analysis. Part II assessed the respondents' knowledge of statistical tools, data presentation, and interpretation using a four-point scale, ranging from Very Knowledgeable (VK) to No Knowledge at All (NK). Part III consisted of open-ended questions to explore challenges and difficulties in performing data and statistical analysis, as well as to elicit proposed strategies and policy recommendations.

To ensure the validity and reliability of the instrument, it underwent content and face validation by five research experts, field testing with non-sample faculty researchers, and internal consistency testing using Cronbach's alpha, with a coefficient of 0.50 required for validity and 0.70 for reliability. Ethical clearance was secured through permission from the Vice President for Academic Affairs (VPAA), and consent was obtained from all participants prior to data collection. The questionnaire was distributed via Google Forms, and responses were collected, screened, and cleaned for analysis.

Data analysis employed multiple statistical and qualitative techniques. Descriptive statistics, including frequency counts and percentages, were used to present the demographic profile of respondents. Mean scores with verbal interpretation assessed the level of knowledge in data and statistical analysis. ANOVA was applied to determine significant differences in knowledge based on demographic variables, while thematic analysis identified the challenges and difficulties encountered. Proposed intervening strategies and policy recommendations were synthesized through textual discussion, supported by recurring themes from the qualitative responses. Table 1 presents the demographic profile of the faculty researchers, including their sex, age, civil status, number of years in teaching, campus and college, field of specialization, and whether they have taught subjects related to data and statistical analysis.

Table 1. Profile of the Respondents.

Sex	**Frequency**	**Percentage**
Male	54	49.50
Female	55	50.5
Total	109	100.0
Age	Frequency	Percentage
20–29	25	22.9
30–39	36	33.0
40–49	23	21.1
50–59	14	12.1
60 and above	11	10.1
Total	109	100.0
Civil Status	Frequency	Percentage
Single	54	49.5
Married	55	50.5
Total	109	100.0
Number of Years in Teaching	Frequency	Percentage
<1–10	58	53.2
11–20	28	25.7
21–30	15	13.8
31–40	4	3.7
41 and Above	4	3.7
Total	109	100.0
Campus	Frequency	Percentage
Sumacab	34	31.2
GT	49	45.0
Atate	11	10.1
Fort Magsaysay	3	2.8
Gabaldon	2	1.8

San Leonardo	7	6.4
Talavera	3	2.8
Total	109	100.0
College	Frequency	Percentage
Architecture	3	2.8
Criminology	7	6.4
Education	22	20.2
Engineering	3	2.8
Information and Communications Technology	12	11.0
Management and Business Technology	14	12.8
Arts and Sciences	11	10.1
Nursing	4	3.7
Public Administration and Disaster Management	2	1.8
Linguistics and Literature	12	11.0
Graduate School	19	17.4
Total	109	100.0
Field of Specialization	Frequency	Percentage
Language and Literature	18	16.5
Business Administration	15	13.8
Information Technology	13	11.9
Engineering and Mathematics	11	10.1
Criminology	8	7.3
Architecture	3	2.8
Science	13	11.9
Social Science	8	7.3
Health	3	2.8
Agriculture	2	1.8
Education	15	13.8
Total	109	100.0
Subject Taught Related to Data and Statistical Analysis	Frequency	Percentage
Yes	55	50.5
No	54	49.5
Total	109	100.0
Subjects (For Data and Statistical Analysis Related)	Frequency	Percentage
No	54	49.5
Statistics	15	13.8
Research	35	32.1
Others (Material and Testing, TQM)	5	4.6
Total	109	100.0
Years (for Data and Statistical Analysis Related)	Frequency	Percentage
No	54	49.5
10 Years and Below	49	45.0
Above 10 Years	6	5.5
Total	109	100.0

4. RESULTS AND DISCUSSIONS

4.1. Demographic Profile of the Faculty Researchers

Among the 109 respondents, 54 (49.5%) were male, and 55 (50.5%) were female, reflecting a balanced gender distribution. This finding supports the theoretical perspective of equity and inclusion in higher education, which emphasizes that diverse faculty populations foster broader perspectives in research and learning environments [13, 14]. Prior studies highlighted the underrepresentation of women in academic leadership and systemic barriers to career progression [15, 16]. Thus, the current gender balance may facilitate collaborative learning and improve overall institutional research productivity, consistent with adult learning theory that values diverse perspectives in experiential learning environments. The majority of faculty were aged 30–39 (33%), followed by 20–29 (22.9%) and 40–49 (21.1%), indicating a relatively young and dynamic workforce. This finding aligns with Kolb's experiential learning theory, which emphasizes that skill development occurs through practical, hands-on experience. Younger faculty are likely more adaptable to new statistical tools, while mid-career and senior faculty contribute institutional knowledge and mentorship [17, 18]. Marital status was nearly evenly split (49.5% single, 50.5% married). While civil status showed no significant difference in statistical knowledge ($F = 1.968$, $p = .164$), it is consistent with literature suggesting that work-life balance considerations influence faculty engagement but do not necessarily impact skill acquisition [19, 20]. Teaching experience revealed that 53.2% of respondents had 1–10 years of experience, showing a predominance of early-career faculty. This aligns with adult learning theory, emphasizing that skill mastery develops progressively with experience [21]. The predominance of novice faculty highlights the need for structured professional development programs in advanced statistical methods. Campus and college distribution showed concentration in GT (45%) and Sumacab (31.2%), with most faculty assigned to the College of Education (20.2%), Management and Business Technology (12.8%), and Linguistics and Literature (11.0%). These findings suggest that access to resources and institutional support may influence research productivity, aligning with theories on organizational learning and faculty development [22-24].

Field specialization revealed higher representation in Language and Literature (16.5%), Business Administration (13.8%), and Information Technology (11.9%). Faculty in Mathematics and Engineering demonstrated greater proficiency in statistical tools, supporting Tuckman's model of skill acquisition, where discipline-specific training leads to higher proficiency [25]. This result aligns with prior research indicating that faculty in the humanities may require targeted statistical skill development to support research competence [26-28]. Table 2 presents the level of knowledge of faculty researchers in data and statistical analysis, specifically in the use and application of statistical tools.

Table 2. Level of knowledge in data and statistical analysis in terms of the use and application of statistical tools.

No.	Use and application of statistical tools	Mean	Standard deviation	Verbal interpretation
1	I can compute the sample size using Slovin's formula or any online sample size calculator based on the population of my respondents.	2.85	.96	Knowledgeable
2	I can obtain the validity and reliability coefficients of my instrument.	2.59	.90	Knowledgeable
3	I can obtain the weighted mean of the responses of my respondents in a Likert scale format.	3.31	.87	Very knowledgeable
4	I can summarize the frequency count of each item in the survey questionnaire based on the given frequency count.	3.36	.83	Very knowledgeable
5	I can compute the percentage of each item in the survey questionnaire based on the given frequency count.	3.32	.90	Very knowledgeable
6	I can rank the data categories from highest to lowest	3.44	.83	Very knowledgeable
7	I can decide when to use correlation analysis, like Pearson's r and Spearman's rho.	2.58	.96	Knowledgeable
8	I can compute the chi-square statistic of a given data set.	2.39	1.02	Slightly knowledgeable
9	I can obtain the regression model based on the available dependent and independent variables.	2.37	1.01	Slightly knowledgeable
10	I can differentiate the use of moderation and mediation analysis.	2.09	.93	Slightly knowledgeable
11	I can use the z or t-test to compare two groups.	2.54	.99	Knowledgeable
12	I can compute the F-value of the given data set using ANOVA.	2.42	1.00	Slightly Knowledgeable
13	I can decide when to use post-hoc analysis.	2.16	.95	Slightly Knowledgeable
14	I can use any non-parametric tests: Kruskal-Wallis H test, Mann-Whitney U test, and Wilcoxon Signed-Rank test in my research when possible.	2.00	.97	Slightly knowledgeable
15	I can use simple modeling techniques such as confirmatory and exploratory factor analysis and equation modeling in my research.	2.04	.94	Slightly knowledgeable
	Average weighted mean	**2.63**	**.72**	**Knowledgeable**

4.2. Level of Knowledge on Data and Statistical Analysis

Faculty demonstrated an overall "Knowledgeable" level (weighted mean = 2.63). High scores in basic statistical tasks such as computing sample sizes, summarizing frequencies, calculating percentages, and ranking data support prior research indicating strong foundational skills among academics [29, 30]. This finding aligns with experiential learning theory, which emphasizes skill acquisition through hands-on practice and applied experience.

Conversely, lower scores in advanced methods (regression, mediation/moderation, chi-square, ANOVA, non-parametric tests) suggest gaps in expertise [31, 32]. These findings support the faculty development model, emphasizing progressive training interventions to build advanced competencies. The relatively low standard deviations indicate consensus among faculty regarding self-assessed knowledge, reinforcing that foundational statistical skills are widely shared, whereas advanced skills require targeted support. Table 3 presents the level of knowledge of faculty researchers in data and statistical analysis, specifically in terms of data presentation and interpretation.

Table 3. Level of knowledge in data and statistical analysis in terms of knowledge of data presentation and interpretation.

No.	Knowledge of data presentation and interpretation	Mean	Standard deviation	Verbal interpretation
1	I can present the data results in a meaningful table and graphs.	3.31	0.78	Very Knowledgeable
2	I can make the results based on the APA style reporting.	3.19	0.87	Knowledgeable
3	I can change the style of the presentation depending on the required format.	3.23	0.80	Knowledgeable
4	I can provide further explanation about the obtained result.	3.21	0.78	Knowledgeable
5	I can present the data results orally in a forum or in any research activities.	3.11	0.86	Knowledgeable
6	I can interpret the appropriateness of the number of sizes based on the computation or by using an online sample size calculator.	2.95	0.90	Knowledgeable
7	I can provide verbal interpretation based on specific validity and reliability coefficients.	2.99	0.90	Knowledgeable
8	I can correctly extract and analyze meaningful information or data from various data sources such as charts, tables, graphs, etc.	3.10	0.84	Knowledgeable
9	I am familiar with the different steps, such as data requirements, data collection, data processing, and data analysis.	3.18	0.77	Knowledgeable
10	I can formulate and present predictable positive outcomes depending on the collected statistics and information.	3.00	0.84	Knowledgeable
11	I know how to utilize a variety of analytic approaches to examine data and come to conclusions that are pertinent to the study being conducted.	2.73	0.91	Knowledgeable
12	I can categorize, manipulate, and summarize the information to answer the research problem in the study being conducted.	3.01	0.84	Knowledgeable
13	I am particularly good at assigning meaning to the collected information and determining the conclusions, significance, and implications of the findings.	2.92	0.86	Knowledgeable
14	I can classify whether the data requires quantitative or qualitative analysis since these are the two most common approaches to data interpretation.	3.01	0.88	Knowledgeable
15	I can analyze and revise the data so that insights can be gained and emerging patterns and behaviors can be identified.	2.81	0.87	Knowledgeable
	Average Weighted Mean	**3.05**	**0.73**	**Knowledgeable**

The findings from Table 3 offer significant insights into the respondents' understanding of data presentation and interpretation, as well as the use and application of statistical tools. According to the weighted mean scores, participants exhibit a proficient level of comprehension in these domains. The overall mean score in data presentation and interpretation was 3.05, suggesting that respondents are capable of effectively presenting and interpreting data using suitable techniques and formats with minimal assistance. Significant mean scores were noted in activities such as presenting data through tables and graphs, adhering to APA-style reporting, elucidating results, and analyzing data from various sources. These results are consistent with the work of Tadese et al. [33] and Barrett and Pack [34], who observed comparable levels of proficiency among professionals, and with Zhao [35], who found that individuals engaged in inquiry typically demonstrate proficiency in conveying information clearly and accurately.

From a theoretical perspective, these findings align with constructivist learning theory, which emphasizes that understanding is constructed through active engagement with meaningful content and through practical application. Faculty members' ability to interpret and present data effectively reflects experiential learning principles, where hands-on engagement with data reinforces comprehension and skill development [36].

Nonetheless, lower scores were observed in areas such as employing diverse analytic methods, attributing significance to data, and recognizing patterns through data reassessment. These findings indicate a need for further professional development in advanced data interpretation techniques [37, 38]. This aligns with faculty development models, which emphasize structured interventions to address skill gaps, particularly for higher-order statistical reasoning and analysis.

The overall mean score for the use of statistical tools was 2.63, categorized as "Knowledgeable," indicating that participants demonstrate competence in fundamental statistical tasks, such as summarizing frequency counts, calculating percentages, ranking data, and determining weighted means. These findings support prior research by Rajwar et al. [39] and Taye [40], highlighting that foundational statistical skills are widely established among professionals. From a theoretical standpoint, this proficiency in basic statistical methods supports Kolb's experiential learning cycle, which suggests that repeated practical application reinforces understanding and skill acquisition over time.

However, the analysis also revealed difficulties in applying sophisticated statistical techniques, including determining when to use mediation or moderation analysis, calculating chi-square statistics, and constructing regression models. These results are consistent with patterns reported by Susnjak and McIntosh [41] and Walter [42], indicating that mastery of advanced statistical methods often requires deliberate, guided learning interventions. This further reinforces the relevance of adult learning theory, which posits that skill development is enhanced through targeted, self-directed, and experiential learning opportunities.

The relatively low standard deviations (0.72–0.91) suggest general agreement among respondents regarding their self-assessed skill levels, indicating a shared understanding of competencies within the group [43].

The findings indicate that participants possess solid foundational knowledge in statistical analysis and data presentation, which supports the theoretical premise that experiential learning and repeated engagement with tasks build competence. However, gaps in advanced techniques highlight the need for structured professional development programs guided by faculty development and adult learning theories. Such interventions would enable faculty to enhance their analytical capabilities, improving the quality and rigor of research outputs.

4.3. Significant Difference in Knowledge of Data and Statistical Analysis Based on Profile

Analysis of Variance (ANOVA) was used to determine the significant differences in knowledge of data and statistical analysis based on profile variables. Profile variables include sex, age, civil status, number of years in teaching, field of specialization, college, and campus. Post-hoc analysis using Bonferroni was also utilized to determine which groups differ from each other. Descriptive statistics such as frequency count, percentage, and standard deviation were used to describe the groups. All analyses were significant at the .05 level of significance. Table 4 presents the significant differences in the faculty researchers' knowledge of data and statistical analysis based on their demographic profile.

Table 4. Significant difference in knowledge of data and statistical analysis based on the profile of the respondents.

Profile	Knowledge of the use and application of statistical tools			Knowledge of data presentation and interpretation			Level of knowledge on data and statistical analysis		
	F	p-value	VI	F	p-value	VI	F	p-value	VI
Sex	0.416	0.520	NS	0.175	0.677	NS	0.338	0.562	NS
Age	1.044	0.388	NS	0.883	0.477	NS	0.987	0.418	NS
Civil Status	3.910	0.051	NS	0.347	0.557	NS	1.968	0.164	NS
Number of years in teaching	1.799	0.135	NS	1.192	0.319	NS	1.194	0.318	NS
Campus	1.374	0.232	NS	1.529	0.176	NS	1.640	0.144	NS
College	1.925	0.051	NS	1.129	0.349	NS	1.583	0.123	NS
Field of Specialization	3.116	0.002*	S	1.279	0.253	NS	1.927	0.050	NS

Note: * significant at. 05 level.
NS - Not Significant; S – Significant; and VI - Verbal Interpretation.

Sex: The results indicate no significant difference in statistical knowledge based on sex. Specifically, for the use and application of statistical tools (F = 0.416, p = 0.520), data presentation and interpretation (F = 0.175, p = 0.677), and overall knowledge on data and statistical analysis (F = 0.338, p = 0.562), male faculty (m = 2.80) demonstrated similar proficiency levels as female faculty (m = 2.87). These findings are consistent with Eren [44], who reported no significant differences in statistical knowledge between male and female faculty members in a similar context. Theoretically, this aligns with adult learning theory, which emphasizes that learning outcomes are influenced more by engagement and prior experience than by demographic characteristics such as sex [45].

Age: Age did not significantly affect faculty knowledge of statistical tools (F = 1.044, p = .388), data presentation and interpretation (F = .883, p = .477), or overall knowledge (F = .987, p = .418). This suggests that faculty across different age groups, from very young (20–29) to very old (60–69), possess comparable statistical knowledge. These results support findings by Li and Xue [46] who found no significant impact of age on statistical knowledge among faculty. From a theoretical perspective, constructivist learning theory implies that knowledge is constructed through experience and active engagement rather than age, which may explain the uniformity in competencies across age groups [47].

Civil Status: No significant differences were observed based on civil status for statistical tools (F = 3.910, p = .051), data presentation and interpretation (F = .347, p = .557), or overall knowledge (F = 1.968, p = .164). Single faculty members (mean = 2.75) and married faculty members (mean = 2.93) showed similar levels of competence. Although direct studies on civil status and statistical knowledge are limited, Dodanwala et al. [48] found that marital status does not significantly influence overall job performance, suggesting that personal circumstances do not affect the acquisition of statistical skills.

Number of Years in Teaching: Faculty experience, ranging from novice (0–10 years) to expert (41 years and above), did not significantly influence statistical knowledge. The F-values for statistical tools (F = 1.799, p = .135), data presentation and interpretation (F = 1.192, p = .319), and overall knowledge (F = 1.194, p = .318) all indicated no significant differences. These findings are in line with Deng and Yu [49], who reported that teaching experience does not necessarily correlate with higher statistical knowledge. This may be interpreted through Kolb's experiential learning theory, which suggests that repeated exposure alone does not guarantee advanced skill development; targeted learning interventions are necessary to enhance expertise [50].

Campus: No significant differences were observed across campuses in the use of statistical tools (F = 1.374, p = .232), data presentation (F = 1.529, p = .176), or overall knowledge (F = 1.640, p = .144). Faculty members across campuses displayed comparable levels of knowledge. While studies directly linking campus location to statistical knowledge are scarce, research on institutional culture and professional development [51, 52] suggests that organizational environment may influence skill acquisition, though this effect may be minimal in the current sample.

College: Similarly, faculty across colleges did not show significant differences in statistical knowledge (statistical tools: F = 1.925, p = .051; data presentation: F = 1.129, p = .349; overall knowledge: F = 1.583, p = .123). This aligns with Berraies and Chouiref [53], who suggest that professional development opportunities can be more influential than college affiliation in shaping statistical competencies. Field of Specialization: A significant difference was observed in the knowledge of statistical tools among faculty from different fields (F = 3.116, p = .002). Post-hoc analysis revealed that faculty in mathematics and engineering fields scored higher than those in language, literature, and architecture. This finding supports Sebola [25], who reported higher statistical proficiency among STEM faculty compared to those in the humanities. However, no significant differences were found in data presentation and interpretation (F = 1.279, p = .253) or overall knowledge (F = 1.927, p = .050), indicating that while domain-specific training enhances technical skills in statistical tools, general data analysis competencies remain similar across fields [46]. From a theoretical standpoint, this is consistent with Tuckman's model of skill acquisition, which posits that domain-specific training and practice lead to higher proficiency in technical tasks [54].

Demographic factors such as sex, age, civil status, years in teaching, campus, and college do not significantly influence faculty knowledge of statistical tools, data presentation, or overall data analysis. However, the field of specialization significantly affects proficiency in statistical tools. These findings are consistent with previous research and theoretical frameworks emphasizing that experiential engagement, domain-specific training, and structured professional development are key determinants of statistical competence, rather than demographic characteristics.

4.4. Challenges and Difficulties Encountered in Data and Statistical Analysis

4.4.1. Challenges and Difficulties in Data and Statistical Analysis

The ability to conduct accurate and meaningful data analysis is fundamental for faculty members in State Universities and Colleges (SUCs) in Region 3, as it informs decision-making, program evaluation, and research outcomes. Despite the growing availability of statistical tools and software, faculty members often encounter several challenges that hinder their effective use of data and statistical analysis.

1. Lack of Statistical Expertise

   A significant challenge faced by faculty members is the lack of statistical expertise. Many faculty members are not adequately trained in advanced statistical methods, which can reduce confidence and proficiency in data analysis [55]. This aligns with constructivist learning theory, which posits that individuals develop knowledge through active engagement and experience [56]. Without sufficient hands-on exposure, faculty are less able to internalize complex statistical concepts, resulting in limited understanding and occasional misinterpretation of data.

2. Insufficient Training and Professional Development Opportunities

   Limited access to continuous training programs is another major challenge. Faculty members often receive minimal exposure to advanced statistical techniques during formal education, making it difficult to adapt to emerging methods [57, 58]. This finding is consistent with adult learning theory, which emphasizes the importance of ongoing, self-directed, and experience-based learning for skill development [59]. Without targeted professional development, faculty struggle to enhance their statistical knowledge and skills.

3. Limited Access to Statistical Software

   Access to reliable statistical software is essential for effective data analysis, yet faculty often face challenges in obtaining and using licensed tools [60]. Budgetary constraints and institutional resource limitations may prevent faculty from employing advanced software, which in turn restricts their ability to conduct sophisticated analyses. This aligns with prior research emphasizing the role of technological infrastructure in shaping faculty performance and competency [33, 34].

4. Time Constraints

Faculty members' heavy workloads, including teaching, research, and administrative responsibilities, limit the time available for in-depth data analysis [61, 62]. This challenge resonates with Kolb's experiential learning theory, which highlights that skill acquisition requires dedicated time for practice and reflection [63]. Insufficient time hinders the development of proficiency in both statistical tools and data interpretation.

5. Complex Data Collection and Preparation

The process of gathering and preparing data for analysis is often complex and time-consuming [64, 65]. Faculty must manage missing or inconsistent data and clean datasets before analysis, which can be technically challenging [66]. This difficulty reflects the theoretical perspective that expertise in statistical analysis is built not only on knowledge of formulas and software but also on practical problem-solving skills developed through iterative, hands-on experience [50].

6. Limited Collaboration and Support

Collaboration with colleagues and access to institutional research support are critical for effective data analysis [67]. However, limited opportunities for interaction with statisticians or experienced researchers can impede guidance and feedback [68, 69]. This finding reinforces adult learning theory, which emphasizes social learning and mentorship as vital components of professional development [70]. A lack of collaborative support restricts the ability of faculty to refine their analytical skills.

Faculty members in SUCs face multifaceted challenges in statistical analysis, including gaps in expertise, limited training, restricted software access, time constraints, complex data preparation, and insufficient collaboration. These challenges highlight the need for targeted interventions, such as structured professional development programs, enhanced access to statistical tools, and supportive collaborative environments, to strengthen faculty capacity in data and statistical analysis. Integrating these strategies aligns with both constructivist and adult learning theories, underscoring the role of active engagement, experiential learning, and mentorship in nurturing statistical proficiency.

4.5. Proposed Intervening Strategies and Policy Recommendation

The results and interpretations of the data suggest several key themes and patterns regarding the intervention strategies that the university can employ to improve knowledge of data and statistical analysis. These themes are based on the open codes, axial codes, and selective codes identified in the analysis. Table 5 presents the proposed intervening strategies and policy recommendations to enhance faculty researchers' knowledge in data and statistical analysis.

Table 5. Proposed intervening strategies and policy recommendations.

Theme/Strategy	Description	Specific actions	Supporting studies
1. Conduct capacity building and development programs	Emphasizes the need for regular and comprehensive training in data and statistical analysis.	Extensive seminars, webinars, and workshops using statistical software.	Shah and Sureja [71]
2. Conduct trainings	Focuses on structured, hands-on, and topic-specific training for faculty.	In-house, intensive, self-paced training on tools like SPSS.	Albert [72]
3. Conduct seminars	Encourages knowledge sharing and updates on data analysis methods.	Regular seminars on statistical approaches, data management, and software use.	Salehi and Sadeq [73]
4. Conduct webinars	Offers accessible learning platforms for continuous knowledge development.	Periodic webinars on data manipulation, interpretation, and advanced topics.	Liu and Yu [74]
5. Expose all faculty to a variety of opportunities	Ensures inclusive training for all faculty members.	Recorded video lessons, one-on-one coaching, expert consultations, and peer learning.	Morina [75] and Giangreco [76]
6. Give financial support and assistance to faculty researchers	Highlights the importance of funding for research and training.	Research grants, funding for training, and software acquisition.	Alsoud and Harasis [77] and Hassani and Silva [78]

Theme/Strategy	Description	Specific actions	Supporting studies
7. Implement extensive research activities	Promotes research culture and practical application of statistical skills.	Encourage faculty-led projects, integrate research into instruction.	Kim and Jung [79]
8. Offer graduate programs related to data analysis	Suggests academic pathways for specialized training in statistics.	Establish graduate-level programs focused on data and statistical analysis.	Li [80]
9. One-on-one coaching and expert consultation	Provides tailored guidance to enhance individual faculty proficiency.	Access to statisticians, personalized coaching, and feedback.	Shafiee Rad [81]

5. CONCLUSION AND RECOMMENDATION

The faculty researchers demonstrate a reasonable level of knowledge in data and statistical analysis, particularly in descriptive statistics and data presentation. However, there is a need for further training and education in advanced statistical tools and the selection of appropriate statistical techniques to enhance their research capabilities.

The findings suggest that there is a need for training and professional development programs to enhance the knowledge and skills of faculty researchers in data and statistical analysis in the SUC of the North. The majority of faculty members have not taught subjects related to data and statistical analysis, indicating a potential gap in expertise. Investing in capacity-building initiatives can help improve the quality of research and academic output in the institution.

The study revealed that there were no significant differences in knowledge levels regarding the use and application of statistical tools, data presentation and interpretation, and overall knowledge of data and statistical analysis based on sex, age, civil status, number of years in teaching, campus, and college. However, there was a significant difference in the knowledge of statistical tools among faculty members in different fields of specialization, with math and engineering faculty having a higher mean.

These findings indicate that faculty members may have similar exposure and experience in research methodology courses, contributing to their knowledge in data presentation, interpretation, and analysis across various factors except for the field of specialization.

The challenges and difficulties faced by faculty members from SUCs in Region 3 regarding data and statistical analysis, with a focus on the utilization of statistical tools and techniques, are multifaceted. These challenges include a lack of statistical expertise, insufficient training opportunities, limited access to statistical software, time constraints, and complex data.

It is recommended to conduct extensive and consistent seminars, webinars, training sessions, and workshops focused on data and statistical analysis using software. These initiatives can help researchers, professionals, and students enhance their skills and knowledge in utilizing statistical tools and software effectively. By providing opportunities for hands-on practice and guidance, such initiatives can contribute to improving the overall competency and proficiency of individuals in data analysis, thereby enabling them to make more informed decisions and interpretations based on robust statistical methods.

Funding: This study received no specific financial support.
Institutional Review Board Statement: The Ethical Committee of the Nueva Ecija University of Science and Technology (NEUST), Philippines, has granted approval for this study on 13 March 2025. (Ref. No. NEUST–RSD–F003).
Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.
Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.
Disclosure of AI Use: The author used OpenAI's ChatGPT (GPT-4) to edit and refine the wording of the Introduction and Literature Review. All outputs were thoroughly reviewed and verified by the author.

REFERENCES

[1] M. B. Garcia, "School reopening concerns amid a pandemic among higher education students: A developing country perspective for policy development," *Educational Research for Policy and Practice*, vol. 23, no. 2, pp. 271-288, 2024. https://doi.org/10.1007/s10671-024-09366-7

[2] M. Alenezi, "Digital learning and digital institution in higher education," *Education Sciences*, vol. 13, no. 1, p. 88, 2023. https://doi.org/10.3390/educsci13010088

[3] K. K. C. Cheung and K. W. H. Tai, "The use of intercoder reliability in qualitative interview data analysis in science education," *Research in Science & Technological Education*, vol. 41, no. 3, pp. 1155-1175, 2021. https://doi.org/10.1080/02635143.2021.1993179

[4] A. Thelen *et al.*, "A comprehensive review of digital twin—part 1: Modeling and twinning enabling technologies," *Structural and Multidisciplinary Optimization*, vol. 65, no. 12, p. 354, 2022. https://doi.org/10.1007/s00158-022-03425-4

[5] S. Oliveira, M. S. Roberto, A. M. Veiga-Simão, and A. Marques-Pinto, "A meta-analysis of the impact of social and emotional learning interventions on teachers' burnout symptoms," *Educational Psychology Review*, vol. 33, no. 4, pp. 1779-1808, 2021. https://doi.org/10.1007/s10648-021-09612-x

[6] H. Lowe, S. Woodd, I. L. Lange, S. Janjanin, J. Barnet, and W. Graham, "Challenges and opportunities for infection prevention and control in hospitals in conflict-affected settings: A qualitative study," *Conflict and Health*, vol. 15, no. 1, p. 94, 2021. https://doi.org/10.1186/s13031-021-00428-8

[7] A. S. Abdelhafiz, A. Ali, A. M. Maaly, H. H. Ziady, E. A. Sultan, and M. A. Mahgoub, "Knowledge, perceptions and attitude of researchers towards using ChatGPT in research," *Journal of Medical Systems*, vol. 48, no. 1, p. 26, 2024. https://doi.org/10.1007/s10916-024-02044-4

[8] Y. Albadarin, M. Saqr, N. Pope, and M. Tukiainen, "A systematic literature review of empirical research on ChatGPT in education," *Discover Education*, vol. 3, no. 1, p. 60, 2024. https://doi.org/10.1007/s44217-024-00138-2

[9] A. Fackler, "When science denial meets epistemic understanding: Fostering a research agenda for science education," *Science & Education*, vol. 30, no. 3, pp. 445-461, 2021. https://doi.org/10.1007/s11191-021-00198-y

[10] A. Alam and A. Mohanty, "Predicting students' performance employing educational data mining techniques, machine learning, and learning analytics," in *International Conference on Communication, Networks and Computing*, 2022: Springer, pp. 166-177.

[11] E. Scharrer and S. Ramasubramanian, *Quantitative research methods in communication: The power of numbers for social justice*, 1st ed. New York: Routledge. https://doi.org/10.4324/9781003091653, 2021.

[12] J. Y. Gray *et al.*, ""Sometimes I'm interested in seeing a fuller story to tell with numbers" Implementing a forecasting dashboard for harm reduction and overdose prevention: A qualitative assessment," *BMC Public Health*, vol. 25, no. 1, p. 915, 2025. https://doi.org/10.1186/s12889-025-22004-y

[13] M. Mousa, "Does gender diversity affect workplace happiness for academics? The role of diversity management and organizational inclusion," *Public Organization Review*, vol. 21, no. 1, pp. 119-135, 2021. https://doi.org/10.1007/s11115-020-00479-0

[14] T. L. Trolian and I. E. T. Parker, "Shaping students' attitudes toward diversity: Do faculty practices and interactions with students matter?," *Research in Higher Education*, vol. 63, no. 5, pp. 849-870, 2022. https://doi.org/10.1007/s11162-021-09668-2

[15] R. Rosa, "The trouble with 'work–life balance' in neoliberal academia: A systematic and critical review," *Journal of Gender Studies*, vol. 31, no. 1, pp. 55-73, 2022. https://doi.org/10.1080/09589236.2021.1933926

[16] J. Ramdeo, "Black women educators' stories of intersectional invisibility: Experiences of hindered careers and workplace psychological harm in school environments," *Educational Review*, vol. 77, no. 2, pp. 475-494, 2025. https://doi.org/10.1080/00131911.2023.2217358

[17] M. Niazi, U. Mahboob, N. Shaheen, S. Gul, M. H. B. Saeed, and A. Kiyani, "Exploring the factors affecting career progression in informal faculty mentoring sessions within mentor and mentee relationships: A qualitative study," *BMC Medical Education*, vol. 24, no. 1, p. 1242, 2024. https://doi.org/10.1186/s12909-024-06170-y

[18] T. Heffernan, "Sexism, racism, prejudice, and bias: A literature review and synthesis of research surrounding student evaluations of courses and teaching," *Assessment & Evaluation in Higher Education*, vol. 47, no. 1, pp. 144-154, 2022. https://doi.org/10.1080/02602938.2021.1888075

[19] N. Denson and K. Szelényi, "Faculty perceptions of work-life balance: The role of marital/relationship and family status," *Higher Education*, vol. 83, no. 2, pp. 261-278, 2022. https://doi.org/10.1007/s10734-020-00654-8

[20] M. Bergström and L. Moulin, "Couple formation is prolonged not postponed. New paths to union formation in contemporary France," *European Journal of Population*, vol. 38, no. 5, pp. 975-1008, 2022. https://doi.org/10.1007/s10680-022-09629-0

[21] V. L. Baker and C. E. N. Manning, *A Mid-Career Faculty Agenda. In L. W. Perna (Ed.), Higher Education: Handbook of Theory and Research.* New York: Springer, 2021.

[22] S. M. Indrawati and A. Kuncoro, "Improving competitiveness through vocational and higher education: Indonesia's vision for human capital development in 2019–2024," *Bulletin of Indonesian Economic Studies*, vol. 57, no. 1, pp. 29-59, 2021. https://doi.org/10.1080/00074918.2021.1909692

[23] L. Labadze, M. Grigolia, and L. Machaidze, "Role of AI chatbots in education: Systematic literature review," *International Journal of Educational Technology in Higher Education*, vol. 20, no. 1, p. 56, 2023. https://doi.org/10.1186/s41239-023-00426-1

[24] N. X. Nguyen, K. Tran, and T. A. Nguyen, "Impact of service quality on in-patients' satisfaction, perceived value, and customer loyalty: A mixed-methods study from a developing country," *Patient Preference and Adherence*, vol. 15, pp. 2523-2538, 2021. https://doi.org/10.2147/PPA.S333586

[25] M. P. Sebola, "South Africa's public higher education institutions, university research outputs, and contribution to national human capital," *Human Resource Development International*, vol. 26, no. 2, pp. 217-231, 2023. https://doi.org/10.1080/13678868.2022.2047147

[26] J. T. McAllister, L. Lennertz, and Z. Atencio Mojica, "Mapping a discipline: A guide to using VOSviewer for bibliometric and visual analysis," *Science & Technology Libraries*, vol. 41, no. 3, pp. 319-348, 2022. https://doi.org/10.1080/0194262X.2021.1991547

[27] S. Okada, K. Murakami, T. Kusumoto, Y. Hirano, K. Amako, and T. Sasaki, "Recent updates of the MPEXS2.1-DNA Monte Carlo code for simulations of water radiolysis under ion irradiation," *Scientific Reports*, vol. 15, no. 1, p. 16534, 2025. https://doi.org/10.1038/s41598-025-00875-w

[28] E. I. Wilder and W. H. Walters, "Characteristics of the most productive U.S. sociology faculty and departments: Institution type, gender, and journal concentration," *The Sociological Quarterly*, vol. 62, no. 3, pp. 594-622, 2021. https://doi.org/10.1080/00380253.2020.1775530

[29] N. L. Schroeder and A. C. Kucera, "Refutation text facilitates learning: A meta-analysis of between-subjects experiments," *Educational Psychology Review*, vol. 34, no. 2, pp. 957-987, 2022. https://doi.org/10.1007/s10648-021-09656-z

[30] A. T. Alabi and M. O. Jelili, "Clarifying likert scale misconceptions for improved application in urban studies," *Quality & Quantity*, vol. 57, no. 2, pp. 1337-1350, 2023. https://doi.org/10.1007/s11135-022-01415-8

[31] C. K. Y. Chan, "A comprehensive AI policy education framework for university teaching and learning," *International Journal of Educational Technology in Higher Education*, vol. 20, no. 1, p. 38, 2023. https://doi.org/10.1186/s41239-023-00408-3

[32] C.-M. Dinh and S. Park, "How to increase consumer intention to use chatbots? An empirical analysis of hedonic and utilitarian motivations on social presence and the moderating effects of fear across generations," *Electronic Commerce Research*, vol. 24, no. 4, pp. 2427-2467, 2024. https://doi.org/10.1007/s10660-022-09662-5

[33] M. Tadese, A. Yeshaneh, and G. B. Mulu, "Determinants of good academic performance among university students in Ethiopia: A cross-sectional study," *BMC Medical Education*, vol. 22, no. 1, p. 395, 2022. https://doi.org/10.1186/s12909-022-03461-0

[34] A. Barrett and A. Pack, "Not quite eye to A.I.: Student and teacher perspectives on the use of generative artificial intelligence in the writing process," *International Journal of Educational Technology in Higher Education*, vol. 20, no. 1, p. 59, 2023. https://doi.org/10.1186/s41239-023-00427-0

[35] D. Zhao, "The impact of AI-enhanced natural language processing tools on writing proficiency: An analysis of language precision, content summarization, and creative writing facilitation," *Education and Information Technologies*, vol. 30, no. 6, pp. 8055-8086, 2025. https://doi.org/10.1007/s10639-024-13145-5

[36] P. Javahery and Z. Bavandi, "Kolb's experiential learning theory in action: Fostering empathy and practical skills in language teacher education," *Reflective Practice*, vol. 27, no. 1, pp. 30–44, 2026. https://doi.org/10.1080/14623943.2025.2521108

[37] V. Braun and V. Clarke, "Is thematic analysis used well in health psychology? A critical review of published research, with recommendations for quality practice and reporting," *Health Psychology Review*, vol. 17, no. 4, pp. 695-718, 2023. https://doi.org/10.1080/17437199.2022.2161594

[38] A. Strzelecki, "To use or not to use ChatGPT in higher education? A study of students' acceptance and use of technology," *Interactive Learning Environments*, vol. 32, no. 9, pp. 5142-5155, 2024. https://doi.org/10.1080/10494820.2023.2209881

[39] K. Rajwar, K. Deep, and S. Das, "An exhaustive review of the metaheuristic algorithms for search and optimization: Taxonomy, applications, and open challenges," *Artificial Intelligence Review*, vol. 56, no. 11, pp. 13187-13257, 2023. https://doi.org/10.1007/s10462-023-10470-y

[40] M. M. Taye, "Understanding of machine learning with deep learning: Architectures, workflow, applications and future directions," *Computers*, vol. 12, no. 5, p. 91, 2023. https://doi.org/10.3390/computers12050091

[41] T. Susnjak and T. R. McIntosh, "ChatGPT: The end of online exam integrity?," *Education Sciences*, vol. 14, no. 6, p. 656, 2024. https://doi.org/10.3390/educsci14060656

[42] Y. Walter, "Embracing the future of artificial intelligence in the classroom: The relevance of AI literacy, prompt engineering, and critical thinking in modern education," *International Journal of Educational Technology in Higher Education*, vol. 21, no. 1, p. 15, 2024. https://doi.org/10.1186/s41239-024-00448-3

[43] H. A. El-Sabagh, "Adaptive e-learning environment based on learning styles and its impact on development students' engagement," *International Journal of Educational Technology in Higher Education*, vol. 18, no. 1, p. 53, 2021. https://doi.org/10.1186/s41239-021-00289-4

[44] Ö. Eren, "Raising critical cultural awareness through telecollaboration: Insights for pre-service teacher education," *Computer Assisted Language Learning*, vol. 36, no. 3, pp. 288-311, 2023. https://doi.org/10.1080/09588221.2021.1916538

[45] S. F. Enyoojo *et al.*, "Satisfaction and learning experience of students using online learning platforms for medical education," *BMC Medical Education*, vol. 24, no. 1, p. 1398, 2024. https://doi.org/10.1186/s12909-024-06411-0

[46] J. Li and E. Xue, "Dynamic interaction between student learning behaviour and learning environment: Meta-analysis of student engagement and its influencing factors," *Behavioral Sciences*, vol. 13, no. 1, p. 59, 2023. https://doi.org/10.3390/bs13010059

[47] J. Piaget, *The principles of genetic epistemology*. United Kingdom: Routledge & Kegan Paul, 1972.

[48] T. C. Dodanwala, D. S. Santoso, and P. Shrestha, "The mediating role of work–family conflict on role overload and job stress linkage," *Built Environment Project and Asset Management*, vol. 12, no. 6, pp. 924-939, 2022. https://doi.org/10.1108/BEPAM-12-2021-0153

[49] X. Deng and Z. Yu, "A meta-analysis and systematic review of the effect of chatbot technology use in sustainable education," *Sustainability*, vol. 15, no. 4, p. 2940, 2023. https://doi.org/10.3390/su15042940

[50] D. A. Kolb, *Experiential learning: Experience as the source of learning and development*. United States: Prentice-Hall, 1984.

[51] S. I. Lei and A. S. I. So, "Online teaching and learning experiences during the COVID-19 pandemic–A comparison of teacher and student perceptions," *Journal of Hospitality & Tourism Education*, vol. 33, no. 3, pp. 148-162, 2021. https://doi.org/10.1080/10963758.2021.1907196

[52] R. Rasheed and A. Rashid, "Role of service quality factors in word of mouth through student satisfaction," *Kybernetes*, vol. 53, no. 9, pp. 2854-2870, 2024. https://doi.org/10.1108/K-01-2023-0119

[53] S. Berraies and A. Chouiref, "Exploring the effect of team climate on knowledge management in teams through team work engagement: Evidence from knowledge-intensive firms," *Journal of Knowledge Management*, vol. 27, no. 3, pp. 842-869, 2023. https://doi.org/10.1108/JKM-09-2021-0720

[54] R. Kassa, T. I. Ogundare, B. Lines, J. Smithwick, and K. Sullivan, "Comparative analysis of human traits and tendencies: General vs. Specialty contractor project managers," *International Journal of Construction Education and Research*, vol. 20, no. 3, pp. 284-300, 2024. https://doi.org/10.1080/15578771.2023.2294197

[55] J. Sulasula and F. Moreno, "Public service delivery system in state universities and colleges: Controversies and best practices across frontline services," *SSRN Electronic Journal*, pp. 1-22, 2023.

[56] A. Shahini, *Constructivism in language learning. In: Language learning theories*. Cham: Palgrave Macmillan, 2025.

[57] J. M. Fernández-Batanero, M. Montenegro-Rueda, J. Fernández-Cerero, and I. García-Martínez, "Digital competences for teacher professional development. Systematic review," *European Journal of Teacher Education*, vol. 45, no. 4, pp. 513-531, 2022. https://doi.org/10.1080/02619768.2020.1827389

[58] H. S. Lee and T. Harrison, "Trends in teaching advanced placement statistics: Results from a national survey," *Journal of Statistics and Data Science Education*, vol. 29, no. 3, pp. 317-327, 2021. https://doi.org/10.1080/26939169.2021.1965509

[59] H. Dong, J. Lio, R. Sherer, and I. Jiang, "Some learning theories for medical educators," *Medical Science Educator*, vol. 31, no. 3, pp. 1157-1172, 2021. https://doi.org/10.1007/s40670-021-01270-6

[60] L. Ashour, "A review of user-friendly freely-available statistical analysis software for medical researchers and biostatisticians," *Research in Statistics*, vol. 2, no. 1, p. 2322630, 2024. https://doi.org/10.1080/27684520.2024.2322630

[61] M. R. Jalongo, "The effects of COVID-19 on early childhood education and care: Research and resources for children, families, teachers, and teacher educators," *Early Childhood Education Journal*, vol. 49, no. 5, pp. 763-774, 2021. https://doi.org/10.1007/s10643-021-01208-y

[62] M. Xavier and J. Meneses, "Persistence and time challenges in an open online university: A case study of the experiences of first-year learners," *International Journal of Educational Technology in Higher Education*, vol. 19, no. 1, p. 31, 2022. https://doi.org/10.1186/s41239-022-00338-6

[63] Y. Wang *et al.*, "Integrating experiential learning theory with innovation and entrepreneurship education: A qualitative study on Chinese medical students," *BMC Medical Education*, vol. 25, no. 1, p. 1227, 2025. https://doi.org/10.1186/s12909-025-07804-5

[64] R. Liu, "Data analysis of educational evaluation using K-Means clustering method," *Computational Intelligence and Neuroscience*, vol. 2022, no. 1, p. 3762431, 2022. https://doi.org/10.1155/2022/3762431

[65] A. Adadi, "A survey on data-efficient algorithms in big data era," *Journal of Big Data*, vol. 8, no. 1, p. 24, 2021. https://doi.org/10.1186/s40537-021-00419-9

[66] K. Eberhard, "The effects of visualization on judgment and decision-making: A systematic literature review," *Management Review Quarterly*, vol. 73, no. 1, pp. 167-214, 2023. https://doi.org/10.1007/s11301-021-00235-8

[67] K. K. Rådberg and H. Löfsten, "The entrepreneurial university and development of large-scale research infrastructure: Exploring the emerging university function of collaboration and leadership," *The Journal of Technology Transfer*, vol. 49, no. 1, pp. 334-366, 2024. https://doi.org/10.1007/s10961-023-10033-x

[68] G. T. Keusch and K. McAdam, *Clinical research on infectious diseases: An overview. In Principles and practice of emergency research response*. United States: Springer, 2024.

[69] F. Martin and J. Borup, "Online learner engagement: Conceptual definitions, research themes, and supportive practices," *Educational Psychologist*, vol. 57, no. 3, pp. 162-177, 2022. https://doi.org/10.1080/00461520.2022.2089147

[70] S. Knowles, *Coaching for professional development. In: Positive Psychology Coaching*. Cham: Springer, 2021.

[71] M. Shah and N. Sureja, "A comprehensive review of bias in deep learning models: Methods, impacts, and future directions," *Archives of Computational Methods in Engineering*, vol. 32, no. 1, pp. 255-267, 2025. https://doi.org/10.1007/s11831-024-10134-2

[72] M. J. Albert, *Navigating the polycrisis: Mapping the futures of capitalism and the earth*. United States: MIT Press, 2024.

[73] M. Salehi and A. S. A. Sadeq, "Knowledge sharing barriers and knowledge sharing facilitators in innovation," *European Journal of Innovation Management*, vol. 27, no. 8, pp. 2701-2721, 2024. https://doi.org/10.1108/EJIM-12-2022-0702

[74] Y. Liu and X. Yu, "Examining the role of artificial intelligence in enhancing business decision-making processes," *Journal of Business Innovation*, vol. 45, no. 2, pp. 112–130, 2023.

[75] D. Morina, "Determinants of credit risk in commercial banks of Kosovo," *International Journal of Economics and Business Administration*, vol. 8, no. 2, pp. 179-190, 2020. https://doi.org/10.35808/ijeba/450

[76] M. F. Giangreco, "Maslow's hammer: Teacher assistant research and inclusive practices at a crossroads," *European Journal of Special Needs Education*, vol. 36, no. 2, pp. 278-293, 2021. https://doi.org/10.1080/08856257.2021.1901377

[77] A. R. Alsoud and A. A. Harasis, "The impact of COVID-19 pandemic on student's e-learning experience in Jordan," *Journal of Theoretical and Applied Electronic Commerce Research*, vol. 16, no. 5, pp. 1404-1414, 2021. https://doi.org/10.3390/jtaer16050079

[78] H. Hassani and E. S. Silva, "The role of ChatGPT in data science: How AI-assisted conversational interfaces are revolutionizing the field," *Big Data and Cognitive Computing*, vol. 7, no. 2, p. 62, 2023. https://doi.org/10.3390/bdcc7020062

[79] J. Kim and S. Jung, "Exploring the impact of digital transformation on organizational performance," *Journal of Business Research*, vol. 58, no. 4, pp. 215–229, 2022.

[80] M. Li, "Adapting legal education for the changing landscape of regional emerging economies: A dynamic framework for law majors," *Journal of the Knowledge Economy*, vol. 15, no. 3, pp. 10227-10256, 2024.

[81] H. Shafiee Rad, "Revolutionizing L2 speaking proficiency, willingness to communicate, and perceptions through artificial intelligence: A case of Speeko application," *Innovation in Language Learning and Teaching*, vol. 18, no. 4, pp. 364-379, 2024. https://doi.org/10.1080/17501229.2024.2309539