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JOURNAL OF SCIENCE AND TECHNOLOGY: A REVIEW OF RESEARCH PHILOSOPHIES AND APPROACHES OF PUBLISHED PAPERS FROM 2000-2020

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ABSTRACT

Understanding research philosophies and approaches are important for identifying appropriate research design, their suitability, reliability and validity for research projects. Here, research philosophies and approaches employed by contributors to the Journal of Science and Technology (JUST) from the year 2000 to 2020 are reviewed. All papers (580 articles) were retrieved from African Journals Online (AJOL), the KNUST institutional repository and the JUST Website. The papers were grouped to reflect the academic disciplines offered at KNUST, the publishers of JUST. The abstracts of the papers were first scrutinised to appreciate the contents and collated keywords. Thereafter, the introduction, materials and methods, results, discussion, and conclusions sections were thoroughly critiqued. The findings revealed that positivism rooted in deductive reasoning dominates the JUST accounting for 87.8% of articles. The use of quantitative analytical tools namely, statistical analysis (68.27%), simulation (7.41%) and mathematical modelling (0.17%) featured in the order presented. Interpretivism rooted in inductive reasoning/qualitative analytical tools represented 14.31% in use. Agriculture, Health and Pure Sciences widely used statistics whilst disciplines in Engineering relied mostly on simulation and modelling. While Agriculture used mostly inferential statistics, the health-related disciplines produced mostly descriptive statistics. Social sciences and humanities including Library and Information studies relied largely on descriptive statistics except economics, which was dominated by inferential statistics. Built environment research relied largely on descriptive statistics while Art-based programmes rely largely on qualitative approaches and narrations. These findings are important in helping the JUST to identify the strengths and weak areas towards encouraging a multi philosophically inclusive publications in the JUST, as a multidisciplinary academic journal. The findings could be helpful to the management of JUST and interested stakeholders towards expanding the profile of research publications knowledge promotion and as training manual for potential authors.

Keywords: JUST, Research approaches, analytical tools, statistical tools, methodology.

INTRODUCTION

Publishing in academia is mandatory and crucial for advancing the frontiers of knowledge tenure. Without knowledge promotion, the whole essence of the relevance and usefulness of academia may be termed as at risk (Mckiernan *et al.*, 2019; Niles *et al.*, 2020; Leal *et al.*, 2021; Morales *et al.*, 2021; Lund *et al.*, 2023). That is why in academia, the common mantra is, either you publish or perish. This publish-or-perish syndrome has engineered academicians to constantly strive to publish their research works in journals and reach out to their peers and the general academic community at large (Dalen, 2021).

In this context, choosing the appropriate research philosophies and approaches is crucial to achieving reliability, validity and for that matter credibility in research projects (Abutabenjeh and Jaradat, 2018; Elshater and Abusaada, 2022). The credibility in the choice of the appropriate research philosophies and approaches engenders confidence in deciding where to publish and the mileage the authors may receive from these papers by way of citations and recognition (Korstjens and Moser, 2017). There is therefore always the need to verify and validate the credibility of the research philosophies and approaches used in academic papers towards engendering rigour in the publishing track (Eshchanov *et al.*, 2021); Lambovska and Todorova, 2021; Frandsen *et al.*, 2022). To this extent, the literature is replete with many studies seeking to assess and validate the quality of papers published in academic journals, focusing on various publishing criteria (Goldacre *et al.*, 2019; Percie *et al.*, 2020).

Apart from these, what many journals have also done in the past and are still ongoing is to occasionally commission and/or encourage review exercises to celebrate milestones of the journals so that recommendations can be made regarding improving publishable areas, methodologies and faculty development (Martin *et al.*, 2021; Nguyen, 2021; Hemmings and Lambert, 2023). This paper is seeking to contribute to this all important appraisal process of the milestone of journals, focusing on the Journal of Science and Technology (JUST), a reputable multidisciplinary journal, published by the Kwame Nkrumah University of Science and Technology, Kumasi, Ghana. Review of previous works suggests that little is said about the review of individual articles in journals to determine research approaches and philosophies. The few articles that reflect a review of individual articles focused on subject based journals and not a multidisciplinary based journal. They include Heeks and Bailur (2007) and Rana *et al.*, (2011) on e-goverment research; Onwuegbuzie, (2012), Eusafzai, (2014), and Coates, (2021) on education; and Schick-Makaroff *et al.*, (2016), Thapaliya and Pathak, (2022) on health.

It is to be noted that in Africa, the prominent face of journals is hosted in the African Journal Online (AJOL). The AJOL which has been in operation since 1988 provides free online hosting to over 500 peer-reviewed journals from 31 countries in Africa including Ghana. The JUST is seen as one of the high-profile journals in Science and Technology hosted by AJOL and is attracting manuscripts from academics across the continent and beyond. According to information available on the JUST website, the journal is a multi-subject journal seeking to publish high- profile articles in the physical, biological, chemical, humanities and technology disciplines with the first issue published in 1988.

What makes JUST unique among other journals is that, it is not subject-specific but attracts papers from all disciplines in the same volume. The advantage of having all disciplines in one publication is

that it offers the opportunity for scholars from different disciplines to observe if not detailed at least of face value, what their peers in other disciplines are publishing, which is encouraging for appreciating research projects from a broader academic environment. Information on the JUST website indicates that three issues are published in a year although there have been some lapses in some years resulting in the publication of only one or two issues per year. JUST has been made fully open access since 2013 (https://www.ajol.info/index.php/just). In the note to authors for the materials and methods section, the JUST website indicates that experimental procedures presented in the various articles should have the capacity to be replicated for comparable results. This suggests that the JUST envisages rigour in research philosophies and approaches in all papers submitted for consideration.

In 2022, KNUST celebrated its 70th anniversary of being in the higher-education space. This among others generated a number of reflexive activities including the publication of a blibliometric study to review the journal's progress over the three decades (Borteye *et al.*, 2023). This bibliometric study by Borteye *et al.*, (2023) focused on establishing the trend in the disciplines (areas of specialisation) dominating in JUST, the main contributing authors and the continental spread of the papers. This paper seeks to contribute to the review process started by Borteye *et al.*, (2023) by focusing on research philosophies and approaches, an area the bibliometrics study failed to touch on but which as highlighted above is critical to the quality of papers for consideration. Thus, the significance of this study aligns with an expressive note to authors on the JUST Website that emphasizes the need for rigour in the experimental procedures in articles submitted for replication purposes. Accordingly, in terms of objectives, this paper seeks to establish an understanding of the spread and inclination in the use of research philosophies and approaches in papers published in the last two decades, the type and analytical tools adopted by the authors and the synergies that exist. It is hoped that the findings of this latest contribution will be useful in helping to drive future policy decision of JUST in rigour of research application for replication, advise faculties on upscaling contribution of papers including lessons on superior analytical tools for continuous professional development in research training.

MATERIALS AND METHODS:

This research is based on a critical review of papers published in the JUST from the year 2000- 2020. The papers were retrieved from AJOL, KNUSTSpace (the institutional repository of KNUST) and JUST Website. The idea to commence the research began on 27th October, 2021, when KNUST launched its 70th anniversary as a global leader in higher education and research on the continent. Subsequently, two research assistants were taken through peer scrutiny of JUST and offered training to search and download all papers from the databases from 2000 to 2020. The exercise to download the relevant papers started in late February 2022 and took one month to complete, ending in the last week of March 2022. A total of 580 papers were downloaded and verified. Papers for all versions were retrieved from the databases except for the year 2002 which was unavailable online. Hard copies of these manuscripts were therefore obtained from the University Relations Office of KNUST.

The review process followed thus: A first scrutiny was done to verify the areas of specialisation and the author affiliations. A second review was also done to clarify specific analyses and research approaches in all the data between July and August

2023. Subsequently, we decided the subject areas into which the papers were going to be grouped. Given the broad range of papers published, we decided to group papers to reflect the academic disciplines of programmes offered in KNUST which also aligns with subject areas as stipulated on the JUST website. Thus, papers were grouped into the subject areas; Agriculture, Architecture, Art Education, Biochemistry, Biological Science/Theoretical and Applied Biology, Botany, Construction Technology and Management, Business Administration, Chemistry, Communication Design, Computer Science, Economics, Education, Engineering, English Language and Communication Sciences, Environmental Science, Food Science and Technology, Geography, History & Political Studies, Industrial Art, Land Economy, Librarianship, Mathematics, Medical Laboratory Sciences, Medicine and Dentistry, Natural Resources, Nursing, Optometry and Visual Science, Pharmacy and Pharmaceutical Sciences, Physics, Physiotherapy and Sports Sciences, Planning, Public Health, Publishing Studies, Religious Studies, Settlements Studies, Sociology & Social Work, Zoology, Energy.

We scrutinised the abstract section of the paper to have an overview of its contents and collate the keywords. Thereafter, we thoroughly critiqued the papers from the introduction right through to the materials sections, methods section and results, discussion and conclusion. The detailed first review of 580 articles was done from January 2023 to June 2023, and the results were retrieved and put into tables in Microsoft Word. The data from Microsoft Word was further imputed in google forms under various headings and questions specially designed for this study and for easy analyses. The data generated through a spreadsheet in Google Forms was transferred to Excel and subsequently to SPSS for analysis.

RESULTS AND DISCUSSION

Types of Research Philosophy and Approach

It is vital for every journal article to be explicit on the research approach or design adopted in the study. It helps in determining the reliability, validity and credibility in the research (Abutabenjeh and Jaradat, 2018; Elshater and Abusaada, 2022). There are at least three reasons why understanding research philosophies is important (Keraminiyage *et al.*, 2005). Here, Eastherby-Smith *et al.,* (2002) identify three reasons for this relevance. Philosophies help to clarify, choose the appropriate research design and identify their limitations (cited in Keraminiyage *et al.*,2005). Relatedly, two contrasting philosophies are identified; positivism at one end of the continuum and interpretivism at the other end. In the literature, positivism argues for research projects to be measured objectively using the quantitative approach, rooted in deductive reasoning (Baškarada and Koronios, 2018) logically deriving applicable validity criteria becomes very difficult (if not impossible. Alternatively, others call for interpretivism in arguing that, reality is socially constructed and should be studied using qualitative approaches rooted in inductive reasoning (Baškarada and Koronios, 2018; Otoo, 2020). The correct application of these two philosophies is rooted in the understanding of their ontological, epistemological and axiological assumptions (Baškarada and Koronios, 2018). The choice of research philosophies influences the research approach to be adopted which in turn determines how the research process is organized including data collection procedures Park *et al.*, (2020); Pilcher and Cortazzi, 2023). Typical examples of research approaches include experiments, surveys, action research, case studies etc.Here, we ascertained the research philosophies

employed in the papers reviewed by using the adopted research approaches as proxies. As shown in Figure 1, It is established that Experimental Design/Experiment accounted for 30.7% (178) of usage followed by survey with questionnaire (Quantitative) with 17.1% (99) , survey and experiment in the same study, 33 (5.7%) and analysis of secondary data using quantitative means accounting for, 7.4% (43) usage. Other quantitative techniques used are as follows: chemical and bacteriological analysis, 37 (6.4%), computer programming/mathematical modelling/Operations Research, 36 (6.2%), Product Design/Machine Design, 23 (4.0%), Laboratory analysis, 12(2.1%), Medical analysis/Medical Diagnosis, 10 (1.7%), Laboratory experiment, 6 (1.0%), Field Observation, 5 (0.9%). From Figure 1 it is to be noted that apart from the above approaches that featured relatively significantly in the papers, there are also quite a number of approaches which have been used sparingly such as financial analysis, Geographical survey - Vertical Electrical Sounding, GIS, Historical Research Methods, Psychometric analysis, Qualitative research, Sensitivity Analysis, model construction, network design, water chemical analysis, Trend analysis and variability analysis, Network Design, Water analysis and Water Chemical analysis.

It is to be noted that these approaches identified, are all derived from the quantitative and hence positivist philosophy, while Book Reviews and Literature Reviews, case studies, conservation analysis, and evaluative research constituting 2.9% (17) falls into qualitative, that is interpretivism.

It is also to be noted that out of the 580 papers reviewed, only two had indications of mixed method, that is, both quantitative and qualitative philosophies have been used, accounting for 0.3% (2).

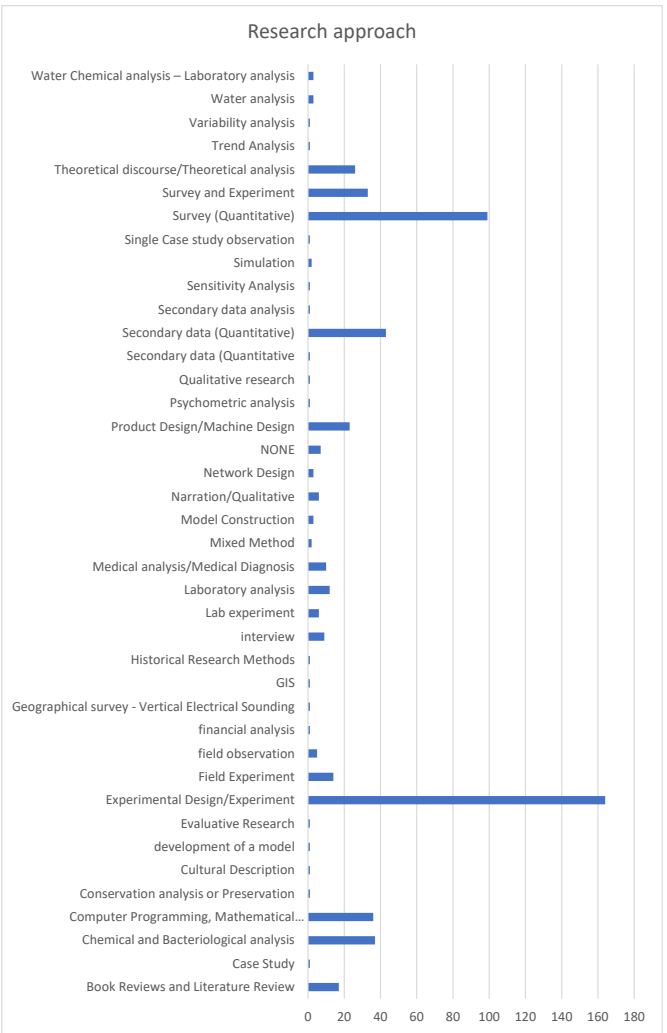

Figure 1: Research approaches adopted in JUST from 2000-2020

The research approaches/methodology were further summarised into quantitative with statistics, and mathematical modelling and qualitative. Various authors have reviewed research methodologies adopted in journals with the aim of ascertaining qualitative and quantitative methodologies, specifically to review their advantages and disadvantages Queiros *et al.*, (2017) and adoption by specific subject areas (Guilherme, 2017).

In this article, Quantitative with statistics were applied in the following context: Chemical and Bacteriological analysis, Conservation analysis or Preservation, Experimental Design/Experiment, Field Experiment, Field Observation, financial analysis, Medical analysis/Medical Diagnosis, Psychometric analysis, Secondary data (Quantitative), Survey (Quantitative) and Experiment, Trend analysis, Variability analysis, Water analysis, Water Chemical analysis-Laboratory

analysis. These approaches generated a total frequency of 417 papers (72.4%).

Quantitative with mathematical modelling was used in the following contexts;: Computer Programming, Mathematical Modelling/ Operations Research, development of a model, Geographical survey - Vertical Electrical Sounding, GIS, Lab experiment, Laboratory analysis, Model Construction, Network Design, Product Design/Machine Design, Sensitivity Analysis and Simulation. The frequency was 89 (15.4%).

Qualitative consisted of Book reviews/ literature reviews, case studies, cultural descriptions, evaluative research, historical research methods, interviews, narration, single case study observation, and theoretical discourse/theoretical analysis. All the qualitative approaches had a frequency of 67 accounting for 11.2% of usage in the JUST.

According to Basias and Yannis Pollallis (2018) "Quantitative research usually involves systematic and empirical investigation of phenomena through statistics , mathematics and the processing of numerical data."

Given that traditionally, quantitative research has dominated research publications in the past (Chen and Hirschheim, 2004; Yilmaz, 2013; Abera, 2019 and Fejes and Nylander, 2015), it is therefore not surprising that quantitative philosophies dominate JUST. Indeed, traditionally quantitative philosophies and approaches have been seen as the yardstick for judging rigour in science and research. It is therefore normal to see quantitative philosophies dominating most academic journals across the globe (Mulisa, 2022).

"The paradigm war over quantitative and qualitative research approaches has raged for more than half a century. However, the late twentieth century and early 21st century have witnessed a shift towards encouraging the use of qualitative philosophies/approaches as an equal alternative to the quantitative approach or a combination of them as a mixed method" (Mulisa, 2022).

Thus, it is clear from the above presentations that, positivism as a research philosophy dominated most of the papers published in JUST accounting for an overall total of 87.8% (quantitative with statistics, 72.4% and quantitative with mathematical modelling, 15.4%). This suggests that most of the authors who publish in JUST follow positivism and deductive reasoning in realising objectivity in their research projects. However, it is also encouraging to see papers based on interpretivism in a high-traditionally science and technology university like KNUST. Guilherme (2017) has identified the same trend in high-impact journals in the area of the creative economy specifically, creative cities, regional development, industries analysis and issues facing business management. Guilherme's study revealed that majority of the articles adopted qualitative methodologies.

In an era where the thinking is the adoption of a multidisciplinary approach to problem solving and also academics being encouraged to use co-production of knowledge techniques, there will be the need for capacity building at KNUST to encourage more intense use of both research philosophies for problem- solving.

Types of analytical methods

Research philosophies and approaches would also normally determine the type of analytical method to use in making meaning out of the data collected. This article also sought to determine the analytical methods used in the papers reviewed. Having an understanding of the choice and use of these tools will help in appreciating the dominant knowledge and skillset, areas

receiving attention and those that are under-utilised and need to be encouraged towards promoting rigour in research in data analysis. For this purpose, the findings were grouped into statistics-based methods, simulation-based methods, mathematical modelling-based methods (quantitative) and qualitative analytical-based methods (see Figure 2).

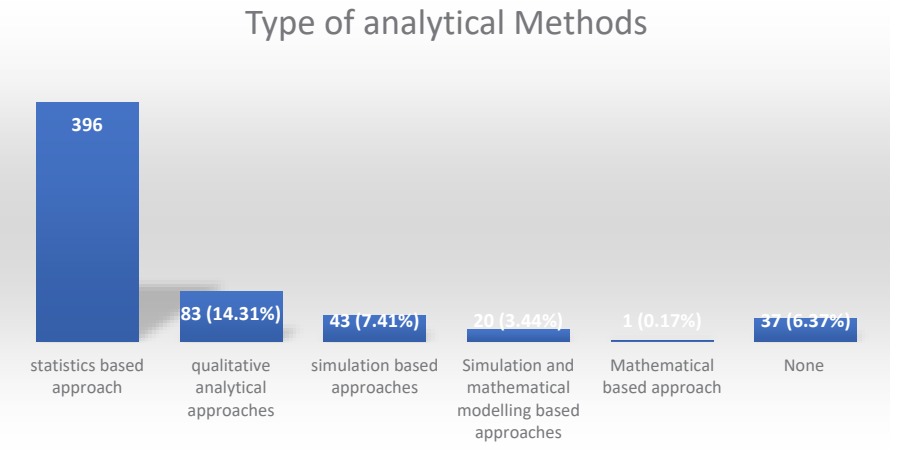

Figure 2: Analytical methods

Figure 2 is an indication that 396 (68.27%) papers adopted statistics-based methods, simulation based-methods accounted for 43 (7.41%) while mathematical based-methods, accounted for less than 1% . It is noted that even though qualitative approaches are not dominant in the papers published in the JUST, the range of methods used for the few papers published accounted for 83 (14.3%). This suggests that there is some encouraging interest in developing skills in the qualitative analytical tools which should be a welcoming news in the bid to promote qualitative research philosophies at JUST. About 37 papers representing 6.3% failed to specifically state and also provide an indication of the type of analytical tool used, hence it was difficult to categorise them.

The dominance of statistics-based methods accounting for 396 (68.27%) articles out of 580, plus the many other mathematical and simulation-based methods re-affirmed the dominance of the positivism philosophy as already mentioned above. As stated earlier, the dominance of the quantitative paradigm and for that matter statistical approaches is to be expected given the science and technology base of KNUST. Moreover, it is important to understand that, statistics is a major tool of research needed in all disciplines. However, what is important is the correct use and choice of statistics especially in choosing between descriptives and inferential statistics and the kind of conclusions reached in the use of these statistics. Consequently, the next section is devoted to exploring the data on statistical analysis further.

Type of statistical tools

Statistics is used to make sense of data collected for quantitative research. In the view of Ali and Bhaskar (2016), the ability to select the right statistical tool to conduct a study determines the validity and reliability of the results. In this respect, the choice is often between two main traditions, descriptive statistics and inferential statistics. According to Leedy and Ormrod (2005), descriptive

statistics is used when the researcher is seeking to identify the characteristics of the phenomenon being observed while inferential statistics is used in situations where the researcher wishes to rule out chance and generalise the findings beyond the observed phenomenon. The reviewed articles published in JUST from 2000-2020 revealed that, authors of 244 (42.1%) articles adopted Inferential statistics and 141 (24.3%) adopted descriptive statistics (see Table 1 in bold).

Table 1: Analytical tools in JUST, 2000-2020

Tool	Frequency	Percentage
Algorithm / Mathematical Modelling	20	3.4
Chemical analysis	1	.2
Chemical extraction	2	.3
Content Analysis	6	1.0
Descriptive Statistics	**141**	**24.3**
Electromyography for evaluating levels of muscle activity	1	.2
Energy equation for parabolic equation channels	1	.2
Factorial Designs	1	.2
Focus groups	1	.2
Images and Narration	13	2.2
Impact strength test, tensile strength test, hardness and elongation test	1	.2
Inferential	**244**	**42.1**
Narration	60	10.3
NONE	37	6.4
Observation and Interview	1	.2
Recovery analysis	1	.2
Relative Capacity Index	1	.2
Secondary data	2	.3
Simulation	39	6.7
Split plot design	1	.2
Static analysis	1	.2
Research Evaluation	2	.3
Trend analysis	2	.3
Wave length analysis	1	.2
Total	580	100.0

Figure 3 below also shows a cloud image of the spread of the use of the statistical tools. The findings in the combined word cloud (figure 3) suggest that when it comes to the use of descriptive statistics, percentages dominate, followed by histogram, frequency in that order, while for inferential statistics; T-Test and ANOVA, chi-square, regression, correlation, Least Significant, Duncan's T-Test, Fishers test.

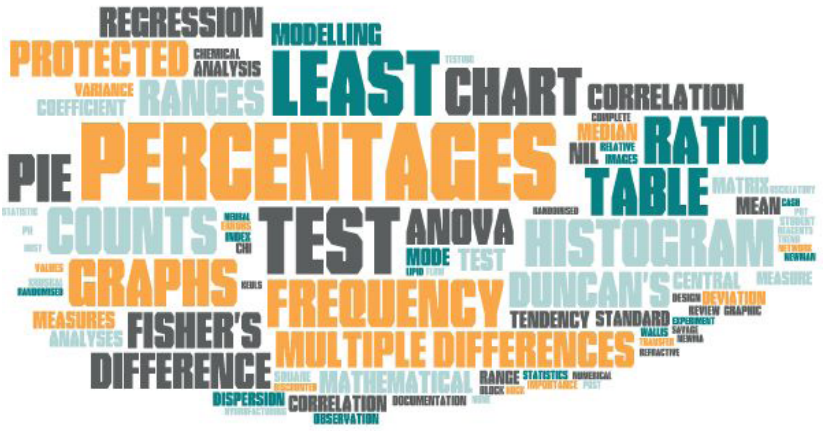

Figure 3: Statistical tools adopted in the articles

While the dominance of percentages as a descriptive statistical tool in the combined word cloud is worth interrogating, it does suggest that many of the papers published are not geared towards theory development in testing hypotheses but rather understanding the characteristics of variables in the phenomenon observed. It also suggests that many of the publications are not addressing the why questions that may lead to understanding and predicting future events but are restricted to the characteristics pertaining to the samples. A critical observation of some of the papers revealed that, while percentages were used, they attempted to generalize their findings which deviates from statistical norms. From statistical theory, the use of descriptive statistics such as percentages does not offer the basis to generalize research findings (Leedy and Ormrod, 2005).

According to the literature, inferential statistics form the basis for generalizing research findings and they offer opportunities for hypothesis testing (Al-Ababneh, 2020; Stapor, 2020; Miller, 2023). It is noted that, within especially KNUST, the Colleges that made wide use of inferential statistics were College of Agriculture and Natural Resources (84 papers), College of Science (40), College of Health Sciences (38) and College of Engineering (30). Table 2 provides full details of how the Colleges as designated at KNUST fared when it came to the choice of inferential statistics as against descriptive statistics. Even though, here the focus was to dwell on the dominance of statistical tools, full details of the range of analytical tools often used in research emanating from the Colleges are also displayed for the benefit of readers (Table 2).

Table 2: Use of Inferential statistics and other tools for analysis

Key:

- College of Agriculture and Natural Resources - CANR
- College of Art and Built Environment - CABE
- College of Engineering - CoE
- College of Health Sciences - CHS
- College of Humanities & Social Sciences - CoHSS
- College of Science - CoS
- Library - Lib.
- N/A – Not Applicable

	CANR	CABE	CoE	CHS	CoHSS	CoS	Lib.	N/A	Total
Algorithm / Mathematical Modelling	0	5	3	0	1	6	0	5	20
Chemical analysis	0	1	0	0	0	0	0	0	1
Chemical extraction	1	0	1	0	0	0	0	0	2
Content Analysis	0	2	2	0	1	1	0	0	6
Descriptive Statistics	20	45	14	29	1	17	7	8	141
Electromyography for evaluating levels of muscle activity	0	0	1	0	0	0	0	0	1
Energy equation for parabolic equation channels	0	0	1	0	0	0	0	0	1
Factorial Designs	0	0	1	0	0	0	0	0	1
Focus groups	1	0	0	0	0	0	0	0	1
Images and Narration	0	11	1	0	0	1	0	0	13
Impact strength test, tensile strength test, hardness and elongation test	0	0	1	0	0	0	0	0	1
Inferential	84	19	30	38	19	40	2	12	244
Narration	4	31	2	2	18	0	1	2	60
NONE	4	4	15	2	1	9	0	2	37
Observation and Interview	0	1	0	0	0	0	0	0	1
Recovery analysis	0	0	0	0	0	1	0	0	1
Relative Capacity Index	0	0	1	0	0	0	0	0	1

Secondary data	1	0	1	0	0	0	0	0	2
Simulation	0	4	25	1	0	7	0	2	39
Split plot design	1	0	0	0	0	0	0	0	1
Static analysis	0	0	1	0	0	0	0	0	1
Statistical Evaluation	0	0	0	0	0	1	0	1	2
Trend analysis	0	0	1	0	0	1	0	0	2
Wave length analysis	0	0	1	0	0	0	0	0	1
	116	123	102	72	41	84	10	32	580

Note: N/A in TABLE 2 means the papers are not from authors at KNUST.

Specialisations dominating in the JUST

With the background that there is increased specialization and active growth of knowledge inside academic subjects (Dalton *et al.*, 2021), this article sought to determine the emerging subject areas at JUST for a 20-year period. This can assist in identifying the issues that researchers are trying to address. Figure 4 is a representation of the dominating subject areas. As can be seen, Agriculture and Engineering have dominated the publications in the Journal over the last 20 years. Disciplines like Medicine and Dentistry, Pharmacy, Planning and Industrial Art also have featured moderately well. While Chemistry and perhaps Biological Science and Architecture have also shown some modest contribution, the contribution of many disciplines such as Education, Optometry and visual science, physiotherapy, History and political scienceand business administration have been virtually low. Two reasons may account for the low patronage of these disciplines. Either, they are publishing mostly outside the scope of the JUST or they do not see the contribution they can make in terms of the scope and research requirements. This study offers the opportunity for these disciplines to be engaged to understand why they are not patronising the JUST and what capacity buildings can be offered to encourage inclusive contributions. Otherwise, this may defeat the multidisciplinary scope that JUST is seeking to promote as a unique journal on the continent and beyond.

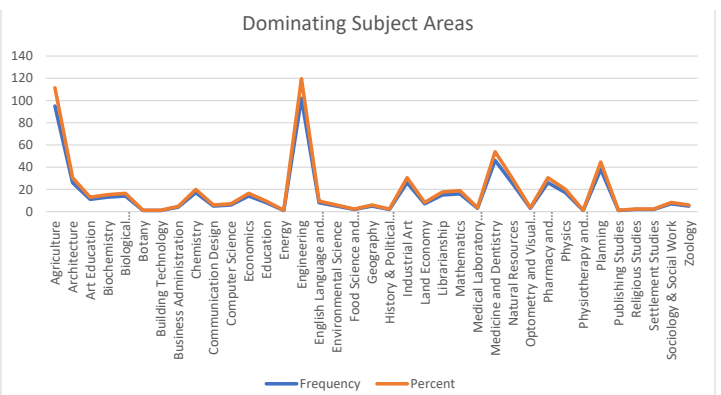

Figure 4: Dominating subject areas

Affiliation of authors

This article also sought to determine the affiliation of authors, specifically, KNUST authors, National authors and international authors. National authors relate to authors outside KNUST but are in Ghana, International authors are those outside Ghana and KNUST authors are staff of KNUST. This was done to determine the extent of collaborations among KNUST authors and those outside KNUST (Dalton *et al.*, 2021) have indicated that since the middle of the 20th century, collaborative research has grown in popularity because of greater specialisation and the dynamic expansion of knowledge within academic domains. Table 3 is a presentation of the data.

Table 3 Affiliation of authors and their collaborators

Affiliation of authors	Frequency	Percentage
International only	106	18.3
KNUST only	300	51.7
KNUST and International	65	11.2
KNUST and National	66	11.4
KNUST, National and International	3	.5
National	32	5.5
National and International	8	1.4
Total	580	100.0

NB: International authors are those outside Ghana National authors are outside KNUST but within Ghana KNUST authors are staff of KNUST.

Table 3 shows that more than half (51.7%) of the papers were authored by KNUST authors, 18.3% were authored by international authors only, 11.2% were a collaboration between KNUST and International authors. A total of 11.4% were authored through a collaboration of KNUST and National authors whereas 5.5% were authored solely by National authors. A collaboration between KNUST and National and International authors had 0.5%. Lastly, National and international collaborations had 1.4%. It is encouraging to see a lot of collaborative papers being published in the JUST as this adds to its global appeal. However, for the KNUST collaboration it is not clear to what extent the sciences and technology disciplines are collaborating with the Social Sciences disciplines. Given that emerging global and community problems require a multi-disciplinary and problem-solving approach, JUST may have to encourage further collaborations amongst the disciplines especially from high publishing disciplines and non-publishing disciplines. As noted by Christensen (2021), the currently fragmented state of research in publications is outmoded in an era of multi-disciplinary expert knowledge to influence public policy It is therefore important for scholars to engage in genuine dialogue across literature, which is what the JUST has the potential of achieving with its multidisciplinary focus, as a journal. While it is positive to see some modest contributions from solely international contributors as well, JUST needs to reach out more in expanding its global contributions.

CONCLUSION AND RECOMMENDATIONS

This paper has attempted to establish the research philosophies and approaches employed in JUST, over the period 2000-2020. The paper is in response to the global appeal for papers to exhibit rigour in research methodology including pluralism and the KNUST JUST policy of encouraging rigour for the replication of research findings. Replication means research methodology would have to be scientifically valid, clearly and unambiguously described, and justified. The findings have revealed that, positivism rooted in deductive reasoning dominates the JUST accounting for over 87.8% of publications. With respect to research approaches, the study observed that, the use of statistics, mathematical modelling and simulation dominates in the JUST. It is observed that Agriculture, Health sciences and Pure Sciences made wide use of statistics whilst Engineering is dominated by simulation. Generally, it is observed that many social science-based disciplines in KNUST rely on descriptive statistics, especially percentages for their studies, which though can be useful, does not offer enough basis for generalising research findings. This has implications for theory development which is a core requirement for advancing knowledge in the social sciences.

The JUST, as a multidisciplinary journal has a lot to gain in encouraging pluralism and pragmatism in the range of papers published to engender multidisciplinary problem solving. Although KNUST is a science and technology university, there is also the need to encourage the wide use of qualitative techniques across many of the disciplines. The intention of this paper is not to generate a discussion of which philosophy, approaches and methods are superior to the other or not, but to offer a platform to appreciate the strengths and weaknesses in the application and encourage lessons for collaboration. It is hoped that the JUST management and interested stakeholders will find the findings useful to help expand the profile of research publications for the promotion of knowledge.

Declaration of Conflict of Interest

The authors declare no potential conflicts of interest regarding the research, authorship, and/or publication of this article.

REFERENCES

Abera, M. (2019). Positive science or interpretive understanding? Transcending legacies of Durkheim and Weber in defining the nature and procedures of social research. *Ethiopian Renaissance Journal of Social Sciences and the Humanities* 6(1):54-74.

Abutabenjeh, S., & Jaradat, R. (2018). Clarification of research design, research methods, and research methodology: A guide for public administration researchers and practitioners. Teaching Public Administration, 36(3), 237–258. Available at: https://doi.org/10.1177/0144739418775787.

Al-Ababneh, M.M. (2020). Linking Ontology, Epistemology and Research Methodology. *Science & Philosophy* 8(1):75–91. Available at: https://doi.org/10.23756/sp.v8i1.500.

Ali, Z. and Bhaskar, S.B. (2016). Basic statistical tools in research and data analysis. *Indian Journal of Anaesthesia* 60(9): 662–669. Available at: https://doi.org/10.4103/0019-5049.190623.

Basias, N. & Yannis Pollallis (2018). Quantitative and Qualitative Research in Business & Technology : Justifying a Suitable Research Methodology. *Review of Integrative Business and Economic Research* 7(1): 91–105.

Baškarada, S. and Koronios, A. (2018). A philosophical discussion of qualitative, quantitative, and mixed methods research in social science. *Qualitative Research Journal* 18(1):2–21. Available at: https://doi.org/10.1108/QRJ-D-17-00042.

Borteye, E.M., Aviamu, Y.A. and Humphrey-, S.A.Y. (2023). Research Paper Celebrating More Than Three Decades Of Scholarly Publishing : A Bibliometric Analysis Of The Journal Of Science And Technology (JUST). *Journal of Science and Technology (Ghana)* 41(2):1–15.

Chen, W., & Hirschheim, R. (2004). A paradigmatic and methodological examination of information systems research from 1991 to 2001. *Information systems journal* 14(3):197-235.

Christensen, J. (2021). Expert knowledge and policymaking: a multi-disciplinary research agenda. *Policy and Politics* 49(3): 455–471. Available at: https://doi.org/10.1332/030557320X15898190680037.

Coates, A. (2021). The prevalence of philosophical assumptions described in mixed methods research in education. *Journal of Mixed Methods Research 15*(2):171-189.

Dalton, A., Wolff, K. and Bekker, B. (2021). Multidisciplinary Research as a Complex System. *International Journal of Qualitative Methods* 20:1–11. Available at: https://doi.org/10.1177/16094069211038400.

Easterby-Smith, M., Thorpe, R., & Lowe, A. (2003). Management research: An introduction (2nd ed.). SAGE Publications.

Elshater, A. and Abusaada, H. (2022). Developing Process for Selecting Research Techniques in Urban Planning and Urban Design with a PRISMA-Compliant Review. *Social Sciences* 11(10):471.

Eshchanov, B., Abduraimov, K. and Ibragimova, M. (2021). Efficiency of " Publish or Perish " Policy — Some Considerations Based on the Uzbekistan Experience. *Publications*. 9(3):33. Eusafzai, H. A. K. (2014). Paradigmatic choices for educational research. *Asian Journal of Social Sciences and Humanities 3*(4):177-185.

Fejes, A., & Nylander, E. (2015). How pluralistic is the research field on adult education?: Dominating bibliometrical trends, 2005-2012. *European journal for Research on the Education and Learning of Adults 6*(2):103-23.

Frandsen, T. F., Lamptey, R. B., Borteye, E. M., Teye, V., & Owusu-Ansah, A. A, (2022). The Journal of Academic Librarianship Implementation of promotion standards to discourage publishing in questionable journals : the role of the library. *The Journal of Academic Librarianship* 48(4):102532. Available at: https://doi.org/10.1016/j.acalib.2022.102532.

Goldacre, B., Drysdale, H., Dale, A., Milosevic, I., Slade, E., Hartley, P., ... & Mahtani, K. R. (2019). COMPare: A prospective cohort study correcting and monitoring 58 misreported trials in real time. *Trials* 20(1):1–16. Available at: https://doi.org/10.1186/s13063-019-3173-2.

Guilherme, L.L. (2017). Creative economy: thematic perspectives addressed and research methodologies adopted', *Brazilian Journal of Science and Technology*. 4(1): 1-17. Available at: https://doi.org/10.1186/s40552-017-0040-0.

Heeks, R., & Bailur, S. (2007). Analyzing e-government research: Perspectives, philosophies, theories, methods, and practice. *Government information quarterly 24*(2):243-265.

Hemmings, H.C. and Lambert, D.G. (2023). Celebrating the first centenary of the British Journal of Anaesthesia: a century of discovery and dissemination. *British Journal of Anaesthesia*. 130(1):1–2. Available at: https://doi.org/10.1016/j.bja.2022.11.006.

Keraminiyage, K., Amaratunga, D. and Haigh, R., (2005). A capability maturity approach for construction process improvement: Use of case studies approach. Available at https://eprints.hud.ac.uk/id/eprint/2271

Kojo, B. (2020). Declaring My ontological and epistemological stance : A Reflective Paper, University of Calgary. *The Journal of Educational Thought (JET)* 53(1):67–88.

Korstjens, I. and Moser, A. (2017). Series: Practical guidance to qualitative research. part 2: Context, research questions and designs. *European Journal of General Practice* 23(1): 274–279. Available at: https://doi.org/10.1080/13814788.2017.1375090.

Lambovska, M. and Todorova, D. (2021). Publish and flourish" instead of "publish or perish": A motivation model for top-quality publications', *Journal of Language and Education*. 7(1):141–155. Available at: https://doi.org/10.17323/jle.2021.11522.

Leal Filho, W., Wall, T., Salvia, A. L., Frankenberger, F., Hindley, A., Mifsud, M., ... & Will, M. (2021). Trends in scientific publishing on sustainability in higher education. *Journal of Cleaner Production*, 296:126569. Available at: https://doi.org/10.1016/j.jclepro.2021.126569.

Leedy, P.E. and Ormrod, .E.J (2005), *Practical research: planning and design*. Prentice Hall.

Lund, B. D., Wang, T., Shamsi, A., Abdullahi, J., Awojobi, E. A., Borgohain, D. J., ... & Yusuf, A. O. (2023). Barriers to scholarly publishing among library and information science researchers : International perspectives. *Information Developmen* 39(2):376–389. Available at: https://doi.org/10.1177/02666669211052522.

Martin, K. D., Borah, A., & Scott, M. L. (2021). The Journal of Public Policy & Marketing at 40 : Celebrating History and Impact. *Journal of Public Policy & Marketing* 40(3):301–321. Available at: https://doi.org/10.1177/07439156211018689.

McKiernan, E. C., Schimanski, L. A., Muñoz Nieves, C., Matthias, L., Niles, M. T., & Alperin, J. P. (2019). Meta-Research: Use of the Journal Impact Factor in academic review, promotion, and tenure evaluations. *eLife*, 8:e47338. Available at: https://doi.org/10.7554/eLife.47338.001.

Miller, J.E. (2023). Beyond Statistical Significance : A Holistic View of What Makes a Research Finding " Important " Beyond Statistical Significance : A Holistic View of What Makes a Research. *Numeracy Advancing Education in Quantitative Literacy* 16(1):Article 6.

Morales, E., McKiernan, E. C., Niles, M. T., Schimanski, L., & Alperin, J. P. (2021). How faculty define quality , prestige , and impact of academic journals.PLOS ONE, 16(10):1–13. Available at: https://doi.org/10.1371/journal.pone.0257340.

Mulisa, F. (2022). When Does a Researcher Choose a Quantitative , Qualitative , or Mixed Research Approach ?. *Interchange* 53(1):113–131. Available at: https://doi.org/10.1007/s10780-021-09447-z.

Nguyen, N.T. (2021). Micromachines: 5000th publications milestone. *Micromachines* 12(12):1573. Available at: https://doi.org/10.3390/mi12121573.

Niles, M. T., Schimanski, L. A., McKiernan,

E. C., & Alperin, J. P. (2020). Why we publish where we do: Faculty publishing values and their relationship to review, promotion and tenure expectations. *PLoS ONE* 15(3): e0228914. Available at: https://doi.org/10.1371/journal.pone.0228914.

Onwuegbuzie, A. J. (2012). Introduction: Putting the MIXED back into quantitative and qualitative research in educational research and beyond: Moving toward the radical middle. *International Journal of Multiple Research Approaches 6*(3):192-219.

Park, Y.S., Konge, L. and Artino, A.R. (2020). The Positivism Paradigm of Research. *Academic Medicine* 95(5):690–694. Available at: https://doi.org/10.1097/ACM.0000000000003093.

Percie du Sert, N., Hurst, V., Ahluwalia, A., Alam, S., Avey, M.T., Baker, M., Browne, W.J., Clark, A., Cuthill, I.C., Dirnagl, U. and Emerson, M. (2020). The ARRIVE guidelines 2 . 0 : Updated guidelines for reporting animal research. *Journal of Cerebral Blood Flow & Metabolism* 40(9):769–777. Available at: https://doi.org/10.1177/0271678X20943823.

Pilcher, N. and Cortazzi, M. (2023). *Across subject fields : implications for research values , assumptions , and practices*, *Quality & Quantity*. Available at: https://doi.org/10.1007/s11135-023-01734-4.

Queirós, A., Faria, D. and Almeida, F. (2017). European Journal of Education Studies Strengths And Limitations Of Qualitative And Quantitative Research Methods. *European Journal of Education Studies* 3(9):369–387. Available at: https://doi.org/10.5281/zenodo.887089.

Rana, N. P., Williams, M. D., Dwivedi, Y. K., & Williams, J. (2011). Reflecting on e-government research: Toward a taxonomy of theories and theoretical constructs. *International Journal of Electronic Government Research (IJEGR) 7*(4):64-88.

Schick-Makaroff, K., MacDonald, M., Plummer, M., Burgess, J., & Neander, W. (2016). What synthesis methodology should I use? A review and analysis of approaches to research synthesis. *AIMS public health 3*(1):172.

Stapor, K. (2020), Descriptive and Inferential Statistics. In: Introduction to Probabilistic and Statistical Methods with Examples in R', in *Intelligent Systems Reference Library, vol 176.* Switzerland: Spinger, Cham. Available at: https://doi.org/https://doi.org/10.1007/978-3-030-45799-0_2.

Thapaliya, S., & Pathak, K. P. (2022). Some Philosophical Paradigms and their Implications in Health Research: A Critical Analysis. *International Research Journal of MMC (IRJMMC) 3*(3):9-17.

van Dalen, H.P. (2021). How the publish-or-perish principle divides a science: the case of economists. *Scientometrics* 126(2): 1675–1694. Available at: https://doi.org/10.1007/s11192-020-03786-x.

Yilmaz, K. (2013). Comparison of quantitative and qualitative research traditions: Epistemological, theoretical, and methodological differences. *European journal of education 48*(2):311-325.