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HYBRID - ORIENTED APPROACH AS AN INTEGRATED TOOL FOR TEACHING BUSINESS MATHEMATICS IN BAUCHI STATE POLYTECHNICS

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ABSTRACT :

This research provides an overview of the practical teaching approach in teaching business mathematics and highlights its benefits in promoting active learning and real-world application of mathematical knowledge. The populations of the study are the Federal Polytechnic and Abubakar Tatari Ali Polytechnic targeting the students from School of Management Science which has about 5,642 students out of which 374 were sampled using Yamane (1960). The recovered questionnaires were 368 which the analyses were based and concluded at 5% level. Data collection involves interview (lecturers taking business mathematics), questionnaire (students) and documentation or Record (CGPA). Data collected was analyzed using both descriptive and inferential statistics (t – test and regression analysis). Findings indicated that practical teaching approach in teaching mathematics has gained attention as an effective method to enhance student learning outcomes and engagement in the subject. This approach involves integrating real-life examples and applications, utilizing manipulatives and visual aids, encouraging problem-solving and critical thinking, fostering collaborative learning, promoting reflection and metacognition, leveraging technology, and supporting differentiated instruction. By incorporating these strategies, educators can create a dynamic and interactive classroom environment that facilitates a deeper understanding of mathematical concepts, improves problem-solving skills, and boosts student motivation and confidence in mathematics.

Key words: Teaching method, Business mathematics, Hybrid- oriented approach, Student's performance

1.Introduction and Background:

Several studies have recognized the limitations of solely theoretical approaches to teaching mathematics in tertiary education, emphasizing the need for practical applications to strengthen conceptual understanding. Teaching mathematics in the present century in developing countries like Nigeria, there is the needs to impart the skills to students that develop them as graduates with learning skills and pertinent capabilities. This research aims to establish a framework for teaching Business Mathematics with skills and expertise for the evolving demands and challenges of the modern computational world.
Mathematics is not limited to learning from text books, lessons, or testing strategies. Students have different learning styles and need to have lessons that help them improve all styles of learning to get the best result. In order to develop the polytechnic to have vibrant students with sound technological knowledge, the proposed research for the practical oriented teaching of Mathematics in higher education will lead to the development of a new teaching pedagogy that will be extremely beneficial to the students. It will impart the insight to the subject basic concept with the knowledge of applications. Implementation of this approach will result in a rich and illustrative standardized practical course which is based on the major concepts of Mathematics in the under graduate curriculum.
Several findings provide evidence for the effectiveness of a hybrid model (practical – approach) in teaching business mathematics likeAmador&Lamberg (2013) highlights how incorporating technology and real-world problem-solving scenarios enhances students' engagement, motivation, and deep understanding of mathematical concepts. In a similar vein, Beckmann (2022) posited that practical applications, such as case studies, simulations, and industry projects, significantly contribute to students' ability to apply mathematical techniques to real-life business problems.
Charalambous & Delaney (2020) emphasize the importance of integrating real-life applications, such as data analysis and financial modeling, to enhance students' critical thinking and problem-solving skills.In the backdrop of the growing prominence, hybrid-oriented learning in the Polytechnic sector is proposed especially for students taken Business Mathematics, the present research intends to investigate the impact of this hybridized pedagogy in teaching Business Mathematics on student's learning outcomes.
As the major advantage of the practical approach, it involves the students working as a team that allows them to work and solve a problem with understanding. Another gain to the student is that via the practical knowledge students will learn and understand the basic skills through hands – on experience and performing, rather than traditional lessons and repetition.
With these, the practical oriented approach can be adopted in higher education as pedagogy to teach Mathematics, to promote visualizing the application of Mathematics in the real world that leads to enhance learning outcomes.

2.Proposed Hybrid Model

In recent years, the need for a practical approach in teaching business mathematics has gained significant attention in tertiary institutions globally. Business mathematics encompasses both theoretical concepts and practical applications, making it essential for students to develop a holistic understanding through a hybrid model that combines both theoretical learning with real-world applications. This literature review aims to explore the effectiveness of the hybrid model in teaching business mathematics in tertiary institutions in Nigeria, by examining the existing scholarly works, research studies, and best practices.

The Changing Global Economy and the Future of Tertiary Institutions in Nigeria (Ololube, 2005): This study discusses the need for tertiary institutions in Nigeria to adapt their curriculum to align with the changing global economy, emphasizing the integration of practical applications in business mathematics education for students to acquire relevant skills.

Business Mathematics as a Tool for Realization of Entrepreneurship Education Objectives (Onyenaucheya & Igwe, 2016): This research highlights the importance of business mathematics in nurturing entrepreneurial skills among students in tertiary institutions. It emphasizes the integration of practical applications in teaching to enhance students' ability to apply mathematical concepts to real business scenarios.

Application of Blended Learning in Teaching Business Mathematics (Adegbola *et al.*, 2018) highlights the effectiveness of combining theoretical instruction with practical applications, providing a comprehensive learning experience for students.The Role of Practical Applications in Enhancing Students' Understanding of Business Mathematics (Ewomazino *et al.*, 2021) demonstrates how hands-on activities, case studies, and real-world examples help students develop a deeper understanding of business mathematics concepts which portray its impact of applications in tertiary institutions.

Anyakoha & Umeike (2017) and Oloruntobi & Olajide (2019) explore the integration of technology, such as online resources and educational software, to enhance the teaching and learning of business mathematics. It highlights the effectiveness of technology in providing practical and interactive learning experiences for students.

This is intended to make the students aware of hoe to apply the rigorous mathematical concepts by the conduct of experiments; presents their understanding through the lens of applicability, think critically, communicate better and thus improve education. The approach is intended for the following:

- A practical oriented approach could act as a mediator/ catalyst that would enhance the learning outcome of the students providing them a visualization of the mathematical concept in the real applications.
- The implementation of the competency approach involves the expansion of the practice of teaching mathematics that will lead to mastering the mathematics as a tool for solving problems of real world and to develop the critical thinking.
- The proposed teaching approach will not only create components of the practical concepts related to the mathematical objects, but will inculcate mathematical thinking in the students to excel in academics.
- A few steps in its pursuit of excellence involve the setting up of the experimental lab, time-to-time review of course curricula, to review and formulate the practical approach, organizing workshops and seminars for students.

All these steps will certainly strive for excellence through research and excellent teaching, driven by curiosity and creativity.

3.Methodology

The population of the study is all Polytechnics in Bauchi state (Federal Polytechnic and Abubakar Tatari Ali Polytechnic) targeting the students from School of Management Sciencewhich has about 5,642 students out of which 374 were sampled using Yamane (1960). The recovered questionnaires were 368 which the analyses were based.

Data collection:

- Interview: Lecturers taking Business Mathematics were engaged in an interview and determining those using conventional method and those incorporating both practical (hybrid) oriented approach.
- Questionnaire: A structured and closed ended questionnaire was developed and validated (Cronbarch's Alpha = 0.788) and used to solicits the respondent's perceptions on the use of practical (hybrid) oriented approach in relation to student's performance. The questionnaire contains information about the demographic characteristics of respondents and other academic variables that will answer the assertions made.
- Documentation/ Record: Results for each of the two categories, CGPA for both students taught using conventional and practical (hybrid) oriented approach were collected and coded (Higher Performance, Medium Performance and Lower Performance).

The selection was systematic and on the basis of 50% male and 50% female. All the information gathered were analyzed using descriptive and inferential statistics (ANOVA) with Statistical Packages for Social Sciences version 23 and the analysis will be based at 5% level of significance.

4.Result and Discussion

4.1Student's Performance on the Mode of Teaching Business Mathematics.

H_0: There is no significant difference between those taught using conventional method and those taught using hybrid-oriented approach.

Teaching Method

	t - test for Equality of Means

		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Teaching Method	Equal variances assumed	-3.948	372	.010	-2.73	.091
	Equal variances not assumed	-3.469	539.927	.014	-2.11	.091

At 5% level, $\alpha = 0.05$ (two tailed test), 0.05. V, the degree of freedom is: $V = n_1 + n_2 - 2 = 206 + 168 - 2 = 372$ The critical value corresponding to the degree of freedom is:

$$t_{\alpha,v} = t_{0.05,372} = 1.645$$

The calculated value of -3.948 (in absolute) is greater than the critical value of 1.645, we therefore concluded that there is significant difference on the average cumulative grade point average for students taught using conventional method and those taught using hybrid – oriented approach.

Descriptive

		N	Mean	Std. Deviation	Std. Error Mean
Teaching Method	Conventional Method	206	2.23	.725	.049
	Hybrid-oriented Approach	168	3.11	.687	.054

The average score by teaching methods has it that the cumulative grade point average for students taught using the conventional method is 2.23 and those taught using practical (hybrid) oriented approach is 3.11. This indicated that those who taught using hybrid-oriented approach perform better than those taught using the conventional method. This is justified by the standard error which is found to be far from the mean value, signifying its reliability.

4.2Regression

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	F	Sig.
1	.878	.771	.768	.6895		.030

Respondent's perceptions on the use of hybrid-oriented approach shows that there is a strong and positive relationship between teaching method and academic performance (R = 0.878). R – square, the coefficient of determination is 0.771. That is about 77.1% of the total variation is explained by the changes in the independent variable indicating that academic performance is influenced by the teaching method by 7.1%. In other word, the teaching method explainedacademic performance by 77.1%.

The adjusted R – Squared value is 76.8%, this also shows that there is high relationship between the dependent and independent variables indicating the actual percentage of variation explained by the independent variable that actually affect the dependent variable. Result shows that if the variable is adequately taken care of (hybrid teaching method), student's academic performance will got enhanced significantly (P - value = 0.000 < 0.05).

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	10.562	.235		44.937	.000
	Teaching Method	2.460	.286	.631	8.615	.000

The predictor yielded a significant beta weight ($\beta = 2.46$) with its varied t – value that is statistically significant implies that there is significant effect of teaching attitudes on student's academic performance (P = 0.000 < 0.05) which form the basis of rejecting the hull hypothesis and concluded that the teaching method affect student's academic performance.

5.Conclusion and Recommendations

In conclusion, a practical teaching approach in teaching business mathematics provides numerous benefits for students. By engaging students in hands-on activities and real-life applications, this approach helps to develop a deeper understanding of mathematical concepts and enhances problem-solving skills and ability. It fosters active learning, critical thinking, and collaboration among students, creating a more dynamic and enjoyable classroom environment. Additionally, practical teaching methods can help to address mathematics anxiety and improve student motivation and confidence in mathematics.

It is recommended that the instructor should utilize manipulatives, such as blocks, counters, and geometric shapes, along with visual aids like graphs, charts, and diagrams, to provide concrete representations of abstract mathematical concepts. These hands-on materials and visuals can enhance students' understanding and make the learning experience more interactive and engaging.

Encourage problem-solving and critical thinking: Emphasize problem-solving skills and critical thinking by presenting students with challenging and open-ended mathematical problems. Encourage them to explore different strategies, think creatively, and justify their reasoning. This approach promotes deeper conceptual understanding and helps students develop problem-solving strategies that can be applied to various mathematical situations.

Foster collaborative learning: Encourage students to work together in groups or pairs to solve problems, discuss mathematical concepts, and explain their thinking. Collaborative learning promotes peer interaction and allows students to learn from and support each other. It also strengthens communication skills and provides opportunities for students to articulate and justify their mathematical reasoning.

Support differentiated instruction: Recognize the diverse learning needs and abilities of students and provide differentiated instruction accordingly. Offer a variety of tasks and activities of varying levels of difficulty to accommodate different learning styles and challenge students at their individual levels. This approach ensures that all students are appropriately engaged and supported in their mathematical learning.
Incorporate real-life examples and applications: Integrate real-life scenarios, problems, and examples into mathematics lessons to help students see the relevance and practicality of the subject. Show them how mathematics is used in everyday life, such as in budgeting, cooking, sports, and construction, to make the concepts more relatable and meaningful.

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