



INFLUENCE OF DIFFERENTIATED INSTRUCTIONAL TECHNIQUES ON LEARNING ACHIEVEMENT IN SECONDARY SCHOOLS IN NAIROBI COUNTY, KENYA: A FOCUS ON APPROVED BUSINESS STUDIES TEXTBOOKS

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ABSTRACT: Study examined significance of differentiated techniques in accelerating learning achievement in business studies among learners in secondary schools in Nairobi County, Kenya. Triggered by persistent underperformance study investigated how varied instructional strategies contributed to academic success. Anchored on social constructivist theory study utilized mixed methods approach incorporating Solomon four-group quasi-experimental design to control for pretest sensitization effects. 200 learners were sampled using stratified random sampling techniques. Quantitative data were analyzed using t-tests, chi-square tests, and linear regression models. Learners perceived differentiated instructional elements such as varied diagrams and test assignments were beneficial in boosting active participation. There was significant positive relationship between differentiated techniques and learning achievement in experimental group ($R^2 = 0.396$, $\beta = 0.217$, $p < .001$), while no significant relationship was observed in control group ($\beta = -0.141$, $p = 0.629$). Study recommends differentiated strategies within textbook guidelines and adequate teacher training to ensure effective classroom implementation of these strategies.

KEYWORDS: Differentiated Instruction, Business Studies, Learning Achievement, Textbook.



INTRODUCTION

Ability to think critically by learners in specific subject area is strengthened when well-designed learning tasks are included in business studies textbooks (Oluoch, Odundo & Mwangi, 2020). Adequately designed learning assignment gives learner privilege to reflect on learnt content solidifying understanding of material, which in turn increases knowledge retention. However, learning is lost and critical thinking is stunted when students are not given adequate time to reflect and think about what they have learnt. In the views of Siervet, Van den Ham and Heize (2021) quality textbook adopts language appropriate for learner increasing learning outcome and development of skills in particular area. Whenever content in textbook is correctly interpreted learning is enhanced in specific field hence escalating development of requisite capabilities. On the contrary misunderstanding of instructions given is likely to lure learners into moments of mistrust and low self-esteem yielding loss of confidence in learning.

As propagated by Bekele, Odundo, Mwangi and Ganira (2022) quality textbook offers learner with opportunity to develop skills and mastery of concept for accelerated learning experience raising improvement scale among learners. Skill development is premised on group discussions and presentations done in class where learner acquires communication and collaboration skill for enhanced learning. Nevertheless, learning episodes are likely to be boring if learners remain passive becoming listeners other than creators of information. Additionally Tarim (2017) postulated that quality instruction help learner to gain knowledge and skills to reason and communicate learnt concepts through solving problems and making wise decisions in life. Logical reasoning facilitates appropriate study skills for catapulted academic results in specific knowledge area. Inadequate instructional content limits learner's ability to reason discouraging enthusiasm and team learning in class. Van den Ham and Heinze (2018) postulate that approved textbooks are licensed by ministry of education as authentic resource aiding in knowledge construction and skill acquisition. In instances where learning resources get to the learners without having right content as instructed by the curriculum, learners are likely to be deluded leading to interrupted learning session.

Moreover, Copur-Gencturk and Tolar (2022) asserted that accurate statements in business studies textbook encourages reading culture yielding academic excellence in specific area. Correctly structuring sentences in textbooks is likely to encourage self-driven learning for higher grades. Being internally motivated to learn through business studies textbook is requisite attitude to achieve well-grounded success in school. Bekele, Odundo, Mwangi and Ganira (2022) reported that use of error-free sentences encourages learner in constructing knowledge raising test scores in specific assessment task. Error free sentences are likely to support learner's quest for more knowledge and understanding by creating friendly learning experiences encouraging development of imaginative skills. On the other hand incorrectly constructed phrases mislead learners contributing to negative deviation in academic results.

Ganira and Odundo (2017) assert that well-planned textbook accelerates consistency in instruction material in encouraging development of requisite skill thereby promoting accomplishment of learning for increased learning outcome. Nevertheless unfamiliar vocabularies in content retard individualized learning impeding mastery of concepts and acquisition of requisite skills and knowledge. In the view of Haspelmath (2019) nature of language influences character formation in teaching and learning of business studies. Learner is likely to acquire desired character if language adopted by business studies textbooks is simple and meet expectation of learner. Simple language encourages group discussion and peer



to peer learning promoting learners self-awareness and respect for others. In cases Business studies textbook fails to adopt appropriate language effective studying among learners is delayed discouraging learning through learner centered technique hence drifting learner into monologue depressing self-efficacy for sustained learning. Appropriately structured business studies textbook meets criteria for textbook evaluation UNESCO (2015). Quality textbook is likely to facilitate achievement of learning and acquisition of capabilities in given task however, in instances where inadequately designed business studies textbooks are presented to learners mean score is likely to be redundant despite of having sufficient textbook accessible to learners.

This study is necessitated by lower achievement results in national examination in business studies as shown by KNEC Report (2023) which revealed business studies results as being low and fluctuating. This study seeks to find out how core textbook can enhance to boost learner performance in business studies. Textbooks might make difference in learning, however if greater support is not provided for classroom implementation, then learning may be hampered (Sithole 2020). This study also seeks to establish if textbooks approved by KICD are correctly accessed and used in supporting learning in public secondary schools.

LITERATURE/THEORETICAL UNDERPINNING

Business studies textbook that is properly designed accommodates student's preference in the learning process. Construction of knowledge is achieved when technique of teaching matches learner interest (Gerhatova, Perichta & Maria 2020). Academic success is achieved where there is a match between the teaching methods and the learner's individual learning style. The learning styles in class are as many as the learners. This means that every learner's style of learning is unique. Therefore, for effective learning to take place teaching methods are likely to match learning styles which as a result leads to achievement of learning objectives. According to Innis (2015) learners' preference for teaching style is determined by the ease at which they learn with a particular teaching style. The learner is likely to have preference for teaching styles that result in a high level of knowledge retention and skill acquisition. This means that every learning activity is likely to provide learners with variety of teaching methods in order to maximize learning achievement.

Differentiated instruction facilitate accomplishment of specific objectives of business education (Robert, O' Keffe, Juan, Lopez, JunXu & Rodger 2015). Specific learning outcome in specific area would be realized fast tracked acquisition of skills. A wide variety of instructional approaches enables students to actively participate in their own education and, as a result, fosters increased information retention and acquisition. On the other side, ineffective teaching strategies make it difficult to retain previously acquired knowledge and comprehend abstract ideas. According to what Richard (2016) has propagated, a sequence of actions that learners participate in support the creation of character, which in turn leads to increased learning. Whenever a textbook for business studies places restrictions or confines itself to a single teaching technique, the goals of the curriculum are likely to be discouraged, which hinders the smooth development of abilities.

The study was underpinned by The Zone of Proximal Development. Lev Semenovich Vygotsky proposed zone of proximal development, sometimes known as ZPD (1978). Zone of



proximal development is difference between what student can accomplish independently and what he can achieve with support for intended learning objectives. It has been used to explain participatory nature of teaching and learning of business studies concepts facilitating acquisition of knowledge which promotes learning achievement. Learning in business studies is a product of interaction between business studies core textbook and the learner in instructional process. Instances where new concepts are being introduced business studies core textbook is likely to offer appropriate support through provision of adequate examples to expound more on fundamental principles behind the concept being introduced encouraging knowledge construction promoting achievement of learning objectives.

METHODOLOGY

This study drew positivism whose main focus is to examine explanatory relationship between two variables in this case approved textbooks and learning achievement (Mohajan, 2018). It suggests that individuals make sense of instructional content by interpreting and constructing meanings from observations and interactions with learning tools for enhanced academic outcome. Additionally, knowledge is generated from understanding of diverse perspectives to learning content and the strategies adopted for specific learning area. Qualitative methods such as interviews, observations, and textual analysis will be used to explore influence of quality of textbooks on learning achievement.

The study adopted mixed method research design incorporating Solomon four-group design, which shall combine both quantitative and qualitative research methods to answer different aspects of research question, thus fully explore relationship between phenomena (Sale, Lohfeld and Brazil 2002). The Solomon four-group design uses quantitative methods to evaluate effectiveness of intervention while controlling threats to internal and external validity (Russ-Eft & Hoover, 2005). The design can be used to test effect of pre-intervention sensitization, which is when pre-intervention measurement influences responsiveness of participants to intervention. The design involves four groups of participants: two treatment groups and two control groups. One treatment group and one control group receive pre-intervention evaluation (pretest) and post-intervention evaluation (post-test), while the other two groups receive only post-test. The advantage of this design is that it can control for effect of pre-intervention sensitization, which is when pre-intervention measurement influences responsiveness of participants to intervention presented.

Target population is particular group or groups of individuals that are central focus of research study (Ponto, 2015). The selection of participants is determined by their alignment with research objectives and capacity to offer valuable perspectives on research subject matter. The target population included secondary school learners enrolled in public schools in Nairobi County who are taking business studies subject, as well as respective subject teachers and subject specialists at the Ministry of Education.

The study applied three tier sampling; simple random sampling in selecting four educational institutions and four sub counties of Nairobi, as per Solomon four-group design principles. The study assumed that every school in country uses approved textbooks for instructional guide and thus has equal chance of being selected. Purposive sampling was applied to select form three class and teachers undertaking business education studies. Orodho et al. (2016) assert that in



purposive sampling, cases are often selected for possessing characteristics of interest. The subject is optional and therefore only appropriate class was chosen. The census approach was applied at class level where every learner in the selected class will participate in the study. The adoption of census on class level gave all the learners same opportunity to participate. As explained by Oluwatayo (2012), census surveys are capable of yielding representative results if they are effectively utilized. In school where there are expected to be multiple Form Three classes, all classes will receive identical instruction for ethical reasons. Subsequently, random sampling method was employed to choose one class to provide data for study.

The analysis involved the use of both descriptive and inferential statistical techniques including a summary of findings in form of tables from coded numbers and percentages. Descriptive statistics included mean, standard deviation, frequency and percentages. On the other hand, inferential statistics involved t-test and regression analysis to test for the influence of evaluation criteria on quality of business studies core textbook used in Kenyan secondary schools. Data collection and analysis are two aspects of qualitative research that are conducted simultaneously. As a result, data was gathered and analysed at the same time by taking notes of all of data from interview sessions with teachers and school principals. After gathering all data through in-depth interviews, researcher organised data for analysis by grouping data into instruments that was used. The researcher then refined codes that had already been derived by reducing them to relevant analytical concepts. The qualitative data was analysed through content analysis of thematic areas.

RESULTS/FINDINGS

Demographic results indicated a diverse age distribution among the 200 Form Three learners surveyed. The majority of respondents were 16 years (38.0%) or 17 years (41.5%), typical for Form Three learners in the Kenyan education system. A notable portion were 15 years old (9.5%), while smaller percentages were 14 years old (0.5%), 18 years old (9.0%), 19 years old (1.0%), and 20 years old (0.5%). The concentration of respondents within the 16-17 age bracket suggests the study primarily captured the perceptions of learners within the standard Form Three age range. However, the presence of younger and older learners indicates some age heterogeneity. The results showed a gender distribution of 113 male learners (56.5%) and 87 female learners (43.5%) among the 200 Form Three learners surveyed. This distribution shows a slight predominance of male participants, but both genders are well represented within the sample. By implication, the fairly balanced gender representation suggests that the study's findings may be more reflective of all learner experiences irrespective of gender. The learners surveyed across five sub-counties: Kamukunji (50 learners, 25.0%), Makadara (25 learners, 12.5%), Mathare (25 learners, 12.5%), Starehe (75 learners, 37.5%), and Westlands (25 learners, 12.5%).



Analysis of Learning Achievement in Business

The study used an independent samples t-test to determine if there was a statistically significant difference in learning achievement (posttest scores) between the experimental and control groups, addressing the research question regarding intervention effectiveness. Levene's test informed the appropriate interpretation of the t-test by assessing variance equality. Table 1 shows the results.

Table 1: Independent Samples T-Test and Group Statistics for Posttest Scores

Group Statistics		Class Groupings		N	Mean	Std. Deviation		Std. Error	Mean	
Posttest Scores		Experimental Group		100	13.96	3.790		.379		
		Control Group		100	3.70	2.564		.256		
Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Posttest Scores	Equal variances assumed	10.030	.002	22.422	198	.000	10.260	.458	9.358	11.162
	Equal variances not assumed			22.422	173.945	.000	10.260	.458	9.357	11.163

The analysis of post-test scores revealed a significant difference in learning achievement between the experimental and control groups. Descriptive statistics indicated that the experimental group, consisting of 100 participants who utilized the business studies textbook, achieved a mean post-test score of 13.96, with a standard deviation of 3.790. In contrast, the control group, also comprising 100 participants but without textbook intervention, exhibited a significantly lower mean score of 3.70, accompanied by a standard deviation of 2.564. Levene's test for equality of variances yielded a significant result ($F = 10.030$, $\text{Sig.} = 0.002$), indicating that the variances between the two groups were not equal. Consequently, the t-test for independent samples was interpreted using the "Equal variances not assumed" row. This analysis revealed a highly significant difference in mean post-test scores ($t = 22.422$, $df = 173.945$, $\text{Sig. (2-tailed)} = 0.000$), with the experimental group demonstrating substantially higher scores. The mean difference between the groups was 10.260, and the 95% confidence interval for this difference ranged from 9.357 to 11.163. These findings strongly suggest that the utilization of the business studies textbook had a significant positive impact on learning achievement, resulting in a substantial improvement in post-test performance compared to the



control group. The significant improvement in post-test scores among learners who used the business studies textbook agrees with Mugo, Odundo, and Muriithi (2020), who found that structured, curriculum-aligned textbooks significantly enhance concept mastery and academic performance in Kenyan secondary schools. Their study highlighted how exposure to well-sequenced instructional content boosts comprehension and retention. However, Sithole (2020) presented a contrasting view, arguing that textbook availability alone does not guarantee improved learning outcomes if not supported by teacher guidance and active classroom engagement, emphasizing that instructional delivery methods may mediate the effect of textbook use.

Analysis of Pretesting Effects

The analysis sought to determine if prior exposure to the pretest significantly influenced subsequent posttest performance, given the potential testing effects that may confound the observed results. Additionally, Levene's test for equality of variances was employed to ensure the appropriate interpretation of the t-test results, as it assesses whether the variances of the two groups are statistically similar. The results are presented in Table 2.

Table 2: Independent Samples T-Test: Effect of Pretesting

Group Statistics		Pretested		N		Mean		Std. Deviation		Std. Error Mean	
Posttest Scores		Yes		100		9.89		6.273		.627	
		No		100		7.77		5.699		.570	
		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference		
									Lower	Upper	
Posttest Scores	Equal variances assumed	2.330	.129	2.501	198	.013	2.120	.848	.449	3.791	
	Equal variances not assumed			2.501	196.206	.013	2.120	.848	.449	3.791	

The analysis aimed to determine the effect of pre-testing on post-test scores. Descriptive statistics revealed that the group which underwent pre-testing, comprising 100 participants, achieved a mean post-test score of 9.89, with a standard deviation of 6.273. Conversely, the group that did not take the pre-test, also consisting of 100 participants, exhibited a mean post-test score of 7.77, accompanied by a standard deviation of 5.699. Levene's test for equality of variances yielded a non-significant result ($F = 2.330$, $\text{Sig.} = 0.129$), indicating that the variances between the two groups were not significantly different. Consequently, the t-test for independent samples was interpreted using the "Equal variances assumed" row. This analysis revealed a statistically significant difference in mean post-test scores ($t = 2.501$, $df = 198$, $\text{Sig. (2-tailed)} = 0.013$), with the pretested group demonstrating higher scores. The mean difference between the groups was 2.120, and the 95% confidence interval for this difference ranged from 0.449 to 3.791. These findings suggest that pre-testing had a statistically significant, albeit



relatively small, positive effect on post-test performance. These finds are consistent with assertions by Roediger and Karpicke (2006) that pre-testing enhances long-term retention by activating prior knowledge and improving attention to learning content. Their work established that testing before instruction primes learners for deeper engagement and recall. However, Chan, McDermott, and Roediger (2006) caution that pre-testing may sometimes mislead learners if incorrect responses are not properly corrected, potentially reinforcing misconceptions.

Analysis of Control Effects

This analysis aimed to isolate and examine potential control effects, and compare posttest scores between two control groups within the Solomon four-group design. The objective was to determine whether there is a statistically significant difference in learning achievement, as measured by posttest scores, between these control groups. The independent samples t-test was used to assess the mean difference in posttest scores between the groups, while Levene's test for equality of variances was used to ensure the appropriate interpretation of the t-test results, specifically regarding whether equal variances should be assumed. The results are presented in Table 3

Table 3: Levene's Test for Equality

Group Statistics		Control Groups	N	Mean	Std. Deviation	Std. Error Mean
Posttest Scores	Control 1		50	2.90	2.082	.295
	Control 2		50	4.50	2.765	.391

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Posttest Scores	Equal variances assumed	6.146	.015	-3.269	98	.001	-1.600	.489	-2.571	-.629
	Equal variances not assumed			-3.269	91.064	.002	-1.600	.489	-2.572	-.628

The analysis aimed to compare the post-test scores of two control groups, Control 1 and Control 2. Descriptive statistics revealed that Control 2, with a mean post-test score of 4.50 and a standard deviation of 2.765, exhibited higher scores than Control 1, which had a mean of 2.90 and a standard deviation of 2.082. Levene's test for equality of variances yielded a significant result ($F = 6.146$, $\text{Sig.} = 0.015$), indicating that the variances between the two control groups were significantly different. Consequently, the t-test for independent samples, using the "Equal variances not assumed" row, revealed a statistically significant difference in mean post-test scores ($t = -3.269$, $df = 91.064$, $\text{Sig. (2-tailed)} = 0.002$). The mean difference was -1.600, with the 95% confidence interval ranging from -2.572 to -0.628, demonstrating that Control 2 had



significantly higher post-test scores than Control 1. These findings suggest that the two control groups differed significantly in their post-test performance, which warrants consideration when interpreting the overall study results. This is consistent with Shadish, Cook, and Campbell (2002), who emphasized that uncontrolled extraneous variables such as teacher effectiveness, classroom environment, or peer influence can create variation even within control groups. This suggests that contextual factors unrelated to the treatment may influence learning outcomes. However, Boruch (1997) cautioned that interpreting differences within control groups without detailed contextual data may lead to overestimating such effects, as random variations and measurement inconsistencies can also produce statistically significant results.

Descriptive Analysis of Learner Perceptions on Differentiated technique and learning achievement

The study's objective four sought to examine dimension of differentiated techniques, specifically targeting the impact of modifying learning materials by including variety such as pictures, tables, charts, diagrams, and artistic illustrations to meet the diverse needs of learners in the classroom, on learning achievement. In this case, the analysis of the influence of differentiated techniques on learner performance in Business Studies was conducted to understand how the quality of textbook-implemented differentiated strategies affects academic outcomes within secondary schools in Nairobi, Kenya. Further, the analysis may provide insights into how specific aspects of differentiated techniques, as perceived by learners, influence their engagement, self-directed learning, and overall comprehension.

To achieve this, respondents from the sampled educational facilities were asked to rate their level of agreement with statements related to differentiated techniques on a scale of one to five, where one represented "strongly disagree" and five represented "strongly agree." The analysis entailed descriptive statistics, specifically frequency distributions, to detail learner perceptions regarding: varying instructional approaches to meet learner needs, providing alternative assignments relevant to learner strengths and interests, instructional resources responsive to learner needs, additional readings and creative assignments, and incorporating guided questions in textbooks. These descriptive statistics will provide a foundational understanding of learner views, informing the subsequent analysis of the relationship between textbook quality, differentiated techniques, and learning achievement.

**Table 4: Descriptive Analysis of Learner Perceptions**

Differentiated technique Items	Strongly disagree		Disagree		Neither agree nor disagree		Agree		Strongly agree		Total
	N	%	N	%	N	%	N	%	N	%	
Varying instructional approaches to meet learner needs encourages self-directed learning supporting mastery of concepts	10	25.6	6	11.5	14	23.0	75	20.5	86	20.0	191
Providing alternative assignments relevant to learner strengths and interest lead to increase in capabilities in particular area	6	15.4	7	13.5	11	18.0	76	20.8	89	20.6	189
Instructional resource that is responsive to learner's needs provide support where needed improving learning achievements	5	12.8	8	15.4	14	23.0	88	24.1	72	16.7	187
Additional readings, creative assignment widens learners' field of wonder providing opportunities for deeper understanding	4	10.3	13	25.0	11	18.0	50	13.7	113	26.2	191
Incorporating guided questions in business studies textbook assist comprehension of ideas resulting in improved learning	14	35.9	18	34.6	11	18.0	76	20.8	71	16.5	190

Regarding the first perception statement stated as “Varying instructional approaches to meet learner needs encourages self-directed learning supporting mastery of concepts”, the results showed that of the 191 respondents, 86 (20.0%) strongly agreed and 75 (20.5%) agreed. Conversely, 6 (11.5%) disagreed, 10 (25.6%) strongly disagreed, and 14 (23.0%) remained neutral. Cumulatively, 161 (40.5%) learners affirmed the statement, while 16 (37.1%) disagreed. This indicates a relatively balanced affirmation that varying instructional approaches encourages self-directed learning and supports concept mastery. This distribution highlights the importance of varied teaching approaches. In this case, quality of textbooks that vary instructional approaches, encourages self-directed learning. Therefore, textbooks should



incorporate diverse instructional methods to cater to different learning styles, fostering self-directed learning and improving concept mastery.

Additionally, the second statement postulated as “Providing alternative assignments relevant to learner strengths and interests leads to increase in capabilities in particular area”, showed that of the 189 respondents, 89 (20.6%) strongly agreed and 76 (20.8%) agreed. However, 7 (13.5%) disagreed, 6 (15.4%) strongly disagreed, and 11 (18.0%) remained neutral. Cumulatively, 165 (41.4%) learners affirmed the statement, while 13 (28.9%) disagreed. This data reveals that learners believe alternative assignments tailored to their strengths and interests enhance their capabilities. This distribution highlights the importance of assignment relevance. Therefore, textbooks should offer a range of assignments that align with diverse learner strengths and interests to maximize capability development.

In terms of the third statement “Instructional resource that is responsive to learner's needs provide support where needed improving learning achievements”, the results showed that of the 187 respondents, 88 (24.1%) agreed and 72 (16.7%) strongly agreed. Conversely, 8 (15.4%) disagreed, 5 (12.8%) strongly disagreed, and 14 (23.0%) remained neutral. Cumulatively, 160 (40.8%) learners affirmed the statement, while 13 (28.2%) disagreed. This indicates that learners perceive responsive instructional resources as supportive and beneficial for learning achievement. This distribution shows that responsive instructional resources are important for learning achievement. Therefore, textbooks should incorporate resources that are adaptable to learner needs, providing support and enhancing learning outcomes.

In regard to the fourth statement, stated as “Additional readings, creative assignment widens learners field of wonder providing opportunities for deeper understanding”, results yielded that of the 191 respondents, 113 (26.2%) strongly agreed and 50 (13.7%) agreed. In contrast, 13 (25.0%) disagreed, 4 (10.3%) strongly disagreed, and 11 (18.0%) remained neutral. Cumulatively, 163 (39.9%) learners affirmed the statement, while 17 (35.3%) disagreed. This suggests that additional readings and creative assignments are perceived to broaden learner understanding. This distribution emphasizes the importance of creative assignments. Therefore, textbooks should include supplementary materials and creative assignments to foster deeper understanding and exploration.

In terms of “Incorporating guided questions in business studies textbook assist comprehension of ideas resulting in improved learning”, the frequency table results showed that of the 190 respondents, 76 (20.8%) agreed and 71 (16.5%) strongly agreed. Conversely, 18 (34.6%) disagreed, 14 (35.9%) strongly disagreed, and 11 (18.0%) remained neutral. Cumulatively, 147 (37.3%) learners affirmed the statement, while 32 (70.5%) disagreed. This result indicates that guided questions are perceived to assist comprehension and improve learning. This distribution shows that guided questions are important for comprehension. Therefore, textbooks should incorporate guided questions to facilitate understanding and enhance learning achievement. The positive learner perceptions regarding varied instructional approaches, alternative assignments, responsive resources, creative tasks, and guided questions are strongly supported by Tomlinson (2014), who emphasized that differentiated instruction through diverse methods, tasks, and content enhances engagement, fosters self-directed learning, and supports mastery of complex concepts. Similarly, Vygotsky's Zone of Proximal Development (as cited in Daniels, 2001) underscores the importance of scaffolding tools like guided questions and creative tasks in helping learners bridge gaps between current and potential understanding. These findings also echo Bruner (1966), who argued that instructional materials tailored to



individual readiness and interest levels significantly improve comprehension and deeper cognitive engagement, affirming that textbooks designed with varied, responsive, and stimulating content are more effective in promoting learning achievement.

Bivariate Analysis of Learner Perceptions on Differentiated technique and learning achievement

The study sought to explore the relationship between learner perceptions of differentiated techniques, represented by a composite score, and learning achievement, as well as group allocation within the Solomon four-group design. Chi-square tests were employed to determine if statistically significant associations exist between these variables. The Solomon four-group design aimed to evaluate the impact of interventions on learner perceptions. Therefore, it is crucial to understand if these interventions differentially influenced how learners perceived the effectiveness of differentiated techniques in enhancing learning outcomes. The chi-square test determines if observed variations in learner perceptions across intervention and control groups are statistically significant, providing insights into the potential influence of the interventions on the perceived effectiveness of differentiated techniques.

Table 5: Learner Perceptions on Differentiated technique

Intervention Control Groups						Chi-Square Tests
	Intervention 1	Intervention 2	Control 1	Control 2	Total	
Strongly disagree	0 0.0%	0 0.0%	1 2.1%	0 0.0%	1 .5%	15.159 (df=12, p-value=0.232)
Disagree	2 4.3%	2 4.0%	2 4.2%	2 4.2%	8 4.2%	
Neither agree nor disagree	10 21.7%	11 22.0%	17 35.4%	6 12.5%	44 22.9%	
Agree	28 60.9%	35 70.0%	27 56.3%	36 75.0%	126 65.6%	
Strongly agree	6 13.0%	2 4.0%	1 2.1%	4 8.3%	13 6.8%	
Total	46 100.0%	50 100.0%	48 100.0%	48 100.0%	192 100.0%	

The analysis of the composite score for differentiated techniques and learning achievement revealed varied patterns in learner perceptions across the Solomon four-group design. In Intervention 1 (n=46), 60.9% agreed and 13.0% strongly agreed that differentiated techniques were effective, while 21.7% were neutral and 4.3% disagreed. Intervention 2 (n=50) showed 70.0% agreement and 4.0% strong agreement, with 22.0% neutral and 4.0% disagreeing. Control 1 (n=48) exhibited 56.3% agreement and 2.1% strong agreement, with 35.4% neutral and 4.2% disagreeing. Control 2 (n=48) demonstrated the highest agreement (75.0%) and 8.3% strong agreement, with 12.5% neutral and 4.2% disagreeing. Overall, among the 192 respondents, 65.6% agreed and 6.8% strongly agreed that differentiated techniques were



effective, while 22.9% were neutral and 4.2% disagreed. The chi-square test yielded a χ^2 value of 15.159 (df=12, $p=0.232$), indicating no statistically significant association between group allocation and learner perceptions of differentiated techniques.

The chi-square test, with a p-value of 0.232, indicates no statistically significant association between the intervention/control groups and learner perceptions of differentiated techniques. This suggests that the interventions and the inherent textbook quality did not significantly influence how learners perceived the effectiveness of differentiated techniques. Despite the lack of statistical significance, the high agreement rates across all groups suggest a generally positive perception of differentiated techniques in enhancing learning achievement. Control 2, which did not receive direct intervention, exhibited the highest agreement, highlighting the potential positive influence of well-designed textbooks that incorporate differentiated techniques. The relatively high percentage of neutral responses, particularly in Control 1, indicates that some learners may have had mixed or uncertain views about the effectiveness of these techniques. These findings are in agreement with the findings of Tomlinson (2014) who emphasizes that differentiated instruction universally supports varied learner needs, regardless of intervention exposure. The strong agreement in Control 2 suggests that well-designed textbooks integrating differentiated elements such as varied tasks and responsive scaffolding can foster positive learner engagement even without formal interventions. However, as Hall (2002) argues, the impact of differentiated instruction may not always translate into measurable group differences due to contextual factors like teacher implementation or learner awareness. These findings reinforce that while perceptions are generally favorable, their translation into achievement outcomes may depend on broader instructional dynamics.

Diagnostic Test Results

To ensure the suitability of linear regression analysis, diagnostic tests were conducted to verify that key assumptions were not violated. These tests focused on assessing the normality of residuals and homoscedasticity (constant variance of residuals), both essential for reliable estimation and inference in regression models.

Normality Testing

Normality of residuals refers to the assumption that the differences between observed and predicted values (residuals) are normally distributed. This is critical for the validity of confidence intervals based on regression. The Kolmogorov-Smirnov and Shapiro-Wilk tests were applied to evaluate this assumption and results presented in Table 6.

Table 6: Normality Test Results

Test	Statistic	Df	Sig.
Kolmogorov-Smirnov	0.098	200	0.023
Shapiro-Wilk	0.956	200	0.041

Both tests yielded p-values less than 0.05, indicating a statistically significant deviation from normality. Although the residuals do not follow a perfect normal distribution, the deviations are minor and acceptable given the sample size of 200, which mitigates the impact due to the Central Limit Theorem.



Heteroscedasticity

Heteroscedasticity occurs when the variance of residuals is not constant across all levels of the independent variable(s). This violates a key regression assumption and can lead to inefficient estimates. The Breusch-Pagan/Cook-Weisberg test was conducted to assess this.

Table 7: Heteroscedasticity Test Results

Test	Chi-Square	p-value
Breusch-Pagan / Cook-Weisberg	5.632	0.018

The p-value of 0.018 is below the 0.05 significance level, leading to the rejection of the null hypothesis of homoscedasticity. This indicates the presence of heteroscedasticity in the data. As a result, standard regression errors may be biased, and robust standard errors or transformation methods may be recommended for improved inference.

Relationship between Differentiated technique and learning achievement

The study sought to analyze the influence of differentiated techniques on learner learning achievement. The hypothesis that guided the analysis was: H_0 : There is no significant relationship between differentiated techniques and learning achievement. To test this hypothesis, the data for differentiated techniques and learning achievement were fitted in separate linear regression models for the experimental and control groups.

Table 8: Relationship between Differentiated technique and learning achievement

Model Summary		R	R Square	Adjusted Square	R	Std. Error of the Estimate	
Experimental Group	1	.629 ^a	.396	.369		.34569	
Control Group	2	.461 ^a	.212	.178		.71102	
ANOVA			Sum of Squares	Df	Mean Square	F	Sig.
Experimental Group	1	Regression	12.402	4	3.100	6.133	.000 _b
		Residual	46.005	91	.506		
		Total	58.406	95			
Control Group	1	Regression	7.125	4	1.781	14.905	.000 _b
		Residual	10.875	91	.120		
		Total	18.000	95			

a. Dependent Variable: Learner Achievement

b. Predictors: (Constant), Composite Score of Differentiated technique, Sub County, Group, Conducted Pretest

The results show that the overall model demonstrated a moderate fit for the experimental group ($R^2 = 0.396$) and a weaker fit for the control group ($R^2 = 0.212$). In the experimental group, approximately 39.6% of the variance in learner learning achievement was accounted for by



differentiated techniques, while in the control group, it was 21.2%. The ANOVA results indicated a statistically significant effect for both groups ($p < .001$), suggesting that differentiated techniques significantly influenced learner learning achievement. Specifically, the experimental group's regression model showed an F-statistic of 6.133, and the control group's model showed an F-statistic of 14.905. This implies that differentiated techniques are likely to influence learning achievement among the learners in both the experimental and control groups. This led to the rejection of the null hypothesis that there is no relationship between differentiated techniques and learning achievement.

The table below presents the unstandardized and standardized coefficients, alongside t-values and significance levels, to detail the specific impact of differentiated techniques on learner learning achievement within each group. These coefficients allow for a comparative analysis of the predictor's effect across the experimental and control settings.

Table 9: Impact of Differentiated Techniques on Learner Learning Achievement

Class Groupings			Unstandardized Coefficients		Standardized Coefficients	t	Sig.
			B	Std. Error	Beta		
Experimental Group	1	(Constant)	-1.126	.515		-2.184	.032
		Conducted Pretest	2.161	.389	2.496	5.555	.000
		Group	-.886	.137	-2.308	-6.456	.000
		Composite Score of Differentiated technique	.217	.047	.959	4.609	.000
		Sub County	.114	.054	.178	2.093	.039
Control Group	2	(Constant)	3.082	.751		4.106	.000
		Conducted Pretest	-2.210	1.644	-1.415	-1.344	.182
		Group	.706	.465	1.012	1.518	.132
		Composite Score of Differentiated technique	-.141	.291	-.268	-.485	.629
		Sub County	-.201	.112	-.167	-1.790	.077

a. Dependent Variable: Learner Achievement

The parameters in the provided table reveal the extent to which a change in the composite score of differentiated techniques influences learner learning achievement, controlling for other variables. In the experimental group, the composite score of differentiated techniques had a significant positive impact ($\beta = 0.217$, $t(91) = 4.609$, $p < .001$). This indicates that for every one-unit increase in the perceived implementation of differentiated techniques, learner learning achievement increased by 0.217 units, with a strong standardized coefficient (Beta = 0.959). This suggests that differentiated techniques are a robust predictor of learning achievement in the experimental setting. Conversely, in the control group, the composite score of differentiated techniques did not significantly predict learner learning achievement ($\beta = -0.141$, $t(91) = -0.485$, $p = 0.629$). The negative coefficient suggests a potential inverse relationship, but it is



not statistically significant. This implies that without the interventions present in the experimental group, differentiated techniques did not significantly influence learner learning achievement.

These regression results concur with observations by Gerhatova, Perichta, and Maria (2020) that business studies textbooks that integrate learner preferences and varied teaching techniques enhance knowledge construction and academic success. This is because differentiated instruction accommodates unique learning styles, which improves retention and facilitates concept mastery. Similarly, Innis (2015) asserted that learners are more likely to achieve higher outcomes when instructional methods align with their preferred learning styles, underscoring the effectiveness of varied teaching strategies. The absence of a significant relationship in the control group mirrors the findings of Richard (2016), who warned that relying on a single, inflexible instructional method may inhibit learning by limiting engagement and character development. Furthermore, Robert et al. (2015) concluded that diverse instructional approaches directly accelerate skill acquisition in business education, reinforcing that differentiation when implemented intentionally through structured interventions is key in learning achievement.

DISCUSSION

The findings revealed that differentiated techniques embedded in business studies textbooks significantly influenced learner achievement when accompanied by intentional instructional support. Learners exposed to textbooks that integrated visual aids, varied tasks, and responsive materials performed notably better, affirming that teaching strategies aligned with learner preferences promote knowledge construction. This supports Gerhatova, Perichta, and Maria (2020), who observed that when instructional content resonates with learners' individual styles, comprehension and academic success improve. These results indicate students benefit most when teaching methods within textbooks match their learning styles, allowing them to retain knowledge more effectively and achieve desired educational outcomes.

Moreover, the role of differentiated instruction in supporting learning objectives was emphasized by the experimental group's positive performance. Learners in this group, who engaged with well-structured textbooks designed with diverse learning activities, demonstrated stronger achievement, concurring with findings of Innis (2015) that teaching styles aligned to learner ease of understanding foster retention and skill development. Similarly, Robert et al. (2015) emphasized that differentiated techniques expedite the realization of specific learning goals by tailoring instruction to diverse learner needs. This study echoes that viewpoint, showing that textbooks with varied instructional elements such as guided questions, creative assignments, and supplemental materials can support learners in acquiring both cognitive and practical skills in business studies.

Moreover, even though learners across all groups generally perceived differentiated techniques positively, the absence of significant perception differences between groups points to the underlying role of textbook design quality rather than intervention alone. This is consistent assertions by Richard (2016) that when textbooks restrict teaching methods to a single format, they limit character development and suppress learning progression. The study's design, grounded in the Zone of Proximal Development, further validates that learners understanding



is most effective when textbooks provide appropriate scaffolding. In essence, well-designed business studies textbooks that cater to learner diversity and offer scaffolded content encourage deeper engagement and help bridge the gap between existing knowledge and intended learning goals.

IMPLICATION TO RESEARCH AND PRACTICE

The findings of this study carry important implications for both educational research and classroom practice. From a research perspective, the results underscore the significance of examining instructional materials not just as static resources but as active agents in shaping learning outcomes. The demonstrated impact of differentiated techniques suggests a need for further inquiry into how textbook design interacts with learner diversity, particularly within varied educational contexts. Future research should explore longitudinal effects of differentiated instruction embedded in core textbooks, as well as the role of teacher mediation in maximizing these effects. Additionally, researchers should consider integrating qualitative insights from learners and educators to deepen the understanding of how instructional tools facilitate or hinder concept mastery in business education.

For educational practice, the study points to need for curriculum developers and textbook authors to embed differentiated instructional techniques within core learning materials. Educators should be encouraged to adopt and adapt textbooks that offer varied content delivery methods such as diagrams, guided questions, alternative assignments, and creative tasks tailored to different learner strengths and preferences. Furthermore, teacher training programs must emphasize the strategic use of textbooks as dynamic instructional aids rather than passive content repositories. School administrators and policymakers should prioritize the approval and procurement of textbooks that demonstrate responsiveness to learner needs, thus ensuring that instructional materials directly contribute to improved academic achievement and inclusive classroom engagement.

CONCLUSION

Differentiated instructional techniques, when thoughtfully integrated into business studies textbooks, play a pivotal role in supporting learner engagement, comprehension, and academic development. The effectiveness of these techniques is not solely dependent on their presence but also on how well they align with diverse learner needs and the instructional environment. Textbooks that present multiple representations of content and varied learning activities create opportunities for self-directed learning and scaffolded knowledge construction, which are essential for achieving curriculum objectives. Therefore, instructional materials should be viewed as active components of the teaching and learning process rather than supplementary tools.

In addition, successful application of differentiated strategies requires a broader pedagogical framework that includes teacher facilitation, learner readiness, and supportive school systems. The integration of varied teaching techniques within textbooks must be complemented by teacher awareness and deliberate instructional planning to be truly effective. Educational systems that promote inclusive, flexible, and learner-centered textbook designs are more likely



to create meaningful learning experiences and equitable outcomes across classrooms. This supports the need for a coordinated approach among curriculum developers, textbook authors, educators, and policymakers to ensure that instructional materials are not only curriculum-aligned but also pedagogically responsive and adaptable to the realities of diverse learning environments.

FUTURE RESEARCH

In view of this study, it is suggested that future research should explore the long-term effects of differentiated instructional techniques embedded in textbooks on learner performance across multiple subjects and grade levels, using longitudinal designs to assess retention and concept mastery over time. Studies should also examine the correlation between teacher facilitation and textbook design to determine how teacher competencies influence the effectiveness of differentiated materials. Additionally, future research should consider investigating the specific elements of textbook design such as visual aids, guided questions, or learner-driven tasks that most significantly impact academic achievement, particularly among learners with diverse cognitive and socio-economic backgrounds. Moreover, mixed-method approaches incorporating classroom observations, teacher interviews, and learner feedback are recommended to provide an understanding of how differentiated instruction operates within real-world educational contexts.

REFERENCES

- Baeten, M., Kyndt, E., Struyven, K., & Dochy, F. (2016). Student-centred learning environments: An investigation into student teachers' instructional preferences and approaches to learning. *Learning Environments Research*, 19(1), 43–62. <https://doi.org/10.1016/j.edurev.2010.06.001>.
- Batman, K. A., Beidoglu, M., & Koklu, S. (2022). Homework assignments for the science and technology course in 5 th grade in Northern Cyprus. *Cogent Education*, 9(1), 2149227. <https://doi.org/10.1080/2331186X.2022.2149227>
- Beak, D., & Beasley J., (2020). Identifying Differentiation Practices of Virtual School Teachers, *Education, Information Technology*. Vol 26, pp 2191-2205.
- Bekele S.G., Odundo P.A., Mwangi J.K. & Ganira K.L. (2022) Learning assignment and quality of business studies textbook in Secondary schools in Kenya, *International journal of research and innovation in social science*, vol 6(3), pages 322-328.
- Bekele, S. G., Odundo P. A., Mwangi, J. K., & Ganira, K.L. (2021). Teaching Methods and Quality of Business Studies Textbook in Secondary Schools in Kenya. *Journal La Edusci*, vol. 2(5), pages 19-29.
- Bojanić, B. & Topalov, J.P. (2016). Textbooks in the EFL Classroom: Defining, Assessing and Analyzing. *Proceedings of the Faculty of Philosophy in Prishtina*, 46 (3).
- Bruner, J. S. (1966). *Toward a Theory of Instruction*. Harvard University Press.
- Cabual, R. A. (2021). Learning styles and preferred learning modalities in the new normal. *Open Access Library Journal*, 8(4), 1-14.
- Chan, J. C. K., McDermott, K. B., & Roediger, H. L. (2006). *Testing improves memory for context*. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 32(5), 1110–1121. <https://doi.org/10.1037/0278-7393.32.5.1110>.



- Daniels, H. (2001). *Vygotsky and Pedagogy*. Routledge.
- Fan, H., Ma, Y., Xu, J., Chang, Y., & Guo, S. (2022). Effects of homework creativity on academic achievement and creativity disposition: Evidence from comparisons with homework time and completion based on two independent Chinese samples. *Frontiers in Psychology*, 13, 923882. <https://doi.org/10.3389/fpsyg.2022.923882>
- Ghazal MH, Nadi MA, Sahib Kazem S, Mosavi F. (2025). The Impact of Active Learning Method on Academic Achievement, Motivation, and Attitudes Towards Mathematics. *International Journal of Education and Cognitive Sciences*, 6(1), 80-88. <https://doi.org/10.61838/kman.ijecs.6.1.8> (students in the experimental group, who received active learning, showed greater academic progress)
- Isa, S. G., Mammam, M. A., Badar, Y., & Bala, T. (2020). The impact of teaching methods on academic performance of secondary school students in Nigeria. *International Journal of Development Research*, 10(6), 37382–37385. <https://doi.org/10.37118/ijdr.18223.07.2020>
- Lim, K.; Go, J.; Kim, J.; Son, J.; Jang, Y. & Joo, M.-H.(2022) Sustainable Effect of the Usefulness of and Preference for Digital Textbooks on Perceived Achievements in Elementary Education Environments. *Sustainability* 2022, 14, 6636. <https://doi.org/10.3390/su14116636>
- Mugo, J. K., Odundo, P. A., & Muriithi, M. D. (2020). *Influence of KICD-Approved Instructional Materials on Learner Achievement in Secondary Schools in Kenya*. *African Journal of Education and Practice*, 6(2), 45–56.
- Muller, J. (2023). Powerful knowledge, disciplinary knowledge, curriculum knowledge: Educational knowledge in question. *International Research in Geographical and Environmental Education*, 32(1), 20–34.
- Odundo P.A & Ganira K.L (2023) Pathways to pathways Participation: The dilemma in early years education learning Environment in Kenya, *Journal La Edusci*, 3(4): 136-148.
- Oschepkov, A. A., Kidinov, A. V., Babieva, N. S., Vrublevskiy, A. S., Egorova, E. V., & Zhdanov, S. P. (2022). STEM technology-based model helps create an educational environment for developing students' technical and creative thinking. *EURASIA Journal of Mathematics, Science and Technology Education*, 18(5), em2110. <https://doi.org/10.29333/ejmste/12033>
- Rintaningrum, R. (2023). Technology integration in English language teaching and learning: Benefits and challenges. *Cogent Education*, 10(1), 2164690.
- Roediger, H. L., & Karpicke, J. D. (2006). *Test-enhanced learning: Taking memory tests improves long-term retention*. *Psychological Science*, 17(3), 249–255. <https://doi.org/10.1111/j.1467-9280.2006.01693.x>
- Sithole B.M (2020), Teacher professional learning in business Education: Mapping the terrain, *academic research international* 11(2), pages 41-53.
- Tomlinson, C. A. (2014). *The Differentiated Classroom: Responding to the Needs of All Learners* (2nd ed.). ASCD.
- UNESCO (2020b), *Global Education Monitoring Report 2020: Inclusion and Education – All Means All*. Paris, UNESCO
- UNESCO (2022), *COVID-19 in Sub-Saharan Africa: Monitoring Impacts on Learning Outcomes*. Institute for Statistics & Australian Council for Educational Research. Main report. http://milo.uis.unesco.org/wp-content/uploads/sites/17/2022/01/MILO-Main-ReportSSA-Jan-2022_EN.pdf