Development and Validation of Instructional Strategies for Effective Inculcation of Quality Management Skills in Building Technology Students of Abia State College of Education (Technical), Arochukwu

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Abstract
The study focused on the development and validation of instructional strategies for effective inculcation of quality management skills in building technology students of Colleges of Education (Tech.), with particular focus on Abia State College of Education (Tech.), Arochukwu. The Research and Development (R&D) design was adopted for the study. The population for the study was 106, comprising 43 building construction teachers, 20 building technology graduates, 23 industrial technical education lecturers and 20 building technology students. There was no sampling as the population of 106 was very manageable. Three research questions and 3 hypotheses guided the study. The hypotheses were tested at 0.05 level of significance. Instruments adopted for data collection consisted of Instructional Activities and Resources for Quality Management Skills Questionnaire (IARQMSQ) and the Quality Management Skills Achievement Test (QMSAT). Data generated were analyzed using frequency, mean and standard deviation for answering the research questions while the hypotheses were tested using ANOVA and ANCOVA. The findings include: the use of projects; demonstrations; field trips; exhibitions; collaborative work and scaffolding; for instructional activities, and architectural/structural/service drawings, schedules and specifications; National building code and other building regulations; and resource persons such as registered builders, manufacturers of quality building materials and managers of top-ranking building construction firms; for instructional resources. It was also discovered that quality management instructional strategies are more effective than conventional instructional strategies in the impartation of quality management skills into building technology students. It was then recommended, among other things, that the National Commission for Colleges of Education (NCCE) should integrate the developed instructional strategies into the building technology programme of Colleges of Education (Tech.) in Nigeria for better inculcation of quality management skills in building technology students. It is hoped that the instructional strategies, when integrated into the curriculum, will help to produce quality management conscious graduates who will in turn impart the same consciousness into their students for the good of the industry and the society at large.

Keywords: *building technology, quality management skills, instructional strategies, instructional activities and resources, and colleges of education (technical).*

Introduction

Building serves many useful purposes for mankind. It provides shelter for factories, residences, schools, laboratories, libraries, town halls, offices, and many more. Therefore, no aspect of life in any society can go without need for one form of building or the other; hence building is considered one of the basic necessities of life as it is very indispensable in the overall wellbeing of man.

However, buildings do not just spring up. They are achieved through a defined process, and this process involves the mechanics of building production. Therefore, the mechanics of production of buildings is known as building technology. When the process is right, quality buildings will emerge. When the process is faulty, it will lead to the production of buildings that cannot guarantee the safety, health and welfare of users of such buildings. Hence, Atkinson, cited in Igboko (2016), opined that quality should be given first place in the building production process. According to the author, it is better, cheaper

and safer to get it right at first attempt than to put it right later. Therefore, quality is very essential in the building production process.

The quality of products and services has variously been discussed. Martin, etal (2025), opine that the quality of a product or service is determined by customer value; society value; level of conformity to earlier agreed specifications; and the degree of satisfaction of environmental, social and economic sustainability requirements; embedded in it. However, quality, according to Salvi and Kerkar (2020), does not happen by chance, rather it is managed at every stage of the product, enabling a company to organize and manage its resources to achieve, maintain and improve quality in a cost-effective manner. According to Yousra, etal (2023), a quality management system refers to equipment that allows a company to manage its processes or activities so that its products or services meet the objectives it has set. The authors maintain that an effective quality management system can help improve product quality, improve processing and efficiency, reduce waste, and increase profits. Other benefits of implementing quality management practices in construction projects as cited in Neyestani (2016), include: customer satisfaction, reduced production time, increased quality awareness, improved product/service quality, improved employee productivity, and improved employee relations.

Therefore, quality management is so crucial it cannot be ignored in the building production process as it focuses directly on the overall satisfaction of all the stakeholders, not just the client. It is, perhaps, the one thing that is needed to put the Nigerian building industry in shape as the industry is currently plagued with serious challenges including building collapse (Akinyemi, &Fadairo, 2018; Bamidele, 2020; Oladikpo, 2022; Alade& Bamidele, 2023; and Olufemi, etal 2026), defective structures (Lesanmi, etal 2023; and Nwankwo & Nwankwo, 2025), use of quacks and untested materials/products (Federal Republic of Nigeria, cited in Igboko, 2016), project failure or abandonment (Okonkwo, 2021), and time/ cost overrun (Maduka, etal, 2026). These challenges cannot be ignored if Nigerians are to derive maximum benefit from the industry.

Perhaps, one way of addressing these challenges might be to infuse quality management skills into the curriculum of institutions charged with the responsibility of training Building Construction Teachers such as Colleges of Education (Tech). These institutions use the National Commission for Colleges of Education (NCCE) minimum standards as their curriculum. From the content of NCCE (2020), it is implied that the Building Technology programme is meant to produce, among others, Building Construction Teachers and practitioners capable of teaching the subject in Junior Secondary Schools; Building Construction Teachers who will be able to inculcate building scientific and technological attitudes and values into the society and; Building Construction Teachers who are motivated to start the so much desired revolution of technological development right from the Nigerian schools. Therefore, the curriculum is designed to produce teachers with the intellectual and Professional background adequate for teaching future or budding building construction workers. Unfortunately, a deeper look at the curriculum shows clear absence of quality management skills. However, Nwachukwu, cited in Igboko (2022), opines that the curriculum of technical and vocational education, of which building technology is a part, must speak of today, of real-life problems facing the environment and life in all its aspects and ramifications. According to the author, the curriculum must be responsive to present life situations, and its contents should derive from the needs of the immediate community. On this score therefore, the curriculum of Abia state college

of education (Tech), Arochukwu must be made to address the current challenges facing the building industry, the situation of which is impacting negatively on the well-being of the citizens. If this is not done, the curriculum will continue to produce graduates who lack the quality management consciousness required to train younger and future building industry operatives who are poised to contribute meaningfully towards sanitizing the building industry. Such graduates will therefore be uncompetitive in the industry.

It was on the basis of the foregoing that Igboko (2022) conducted a study which focused on the integration of specific objectives and content of quality management skills into the building technology curriculum of Abia State college of Education (Technical), Arochukwu. The study came up with a number of findings, including 21 specific objectives and 65 content areas of management skills for integration into the curriculum. It was therefore recommended that appropriate instructional strategies should be developed for effective inculcation of the identified quality management skills into the students. If this is not done, the institutions will continue to adopt ineffective instructional strategies in the teaching of the quality management content areas thereby producing graduates who are not quality conscious and hence have nothing significant to contribute towards growing the building industry.

Instruction, according to Amiri, etal (2025), should be grounded in effective teaching strategies which impact how students engage with content, learn with each other and build skills for a lifetime. In the opinion of the authors, instructional strategies should serve as essential tools in this age of constantly changing classrooms, rapid progress in technology, and growing awareness of the needs of diverse learners. However, instructional strategies can take different forms, including instructional activities and instructional resources.

Therefore, instructional activities are parts of instructional strategies. According to Barwuah (2020), they are those principles, pedagogy and management techniques applied by the teacher during classroom instruction to facilitate the process of knowledge transmission. According to the author, the effectiveness or success of any instructional activity is dependent upon the instructional style and its suitability for the specific objectives and level exit outcomes. Ayeni (cited in Isa, etal 2020), sees an instructional activity as a systematic process of transmitting knowledge, attitudes and skills in accordance with professional principles. Further, Edward (cited in Ahmed and Ahmed, 2023), stressed the need for instructional activities to be based on real-life experiences to help students transform knowledge or information into their personal knowledge, which they can apply in different situations and hence prepare them for future life. However, instructional activities do not go alone, rather they are complemented with vital resources called instructional resources.

According to Dar, etal (2022), instructional resources are the essential tools that assist the teacher in delivering effective and engaging lessons. In the opinion of the authors, instructional resources serve as supplementary devices that support, rather than replace, the teaching process. Contributing, Zuraisham, etal (2025), opine that instructional resources play a vital role in helping students understand abstract concepts by providing concrete representations through visual, auditory, or tactile experiences. The authors maintain that instructional resources enrich the teaching and learning process by stimulating the interest and curiosity students in the subject matter thereby ensuring active participation and deeper comprehension. Therefore, instructional activities and resources are the strategies employed by the teacher to impart relevant skills, attitudes and

knowledge into students for solving life's problems.

However, given the many challenges plaguing the building industry in Nigeria, it becomes imperative to develop and validate suitable instructional strategies that will aid the impartation of quality management skills into building technology students of Abia State College of Education (Tech.), Arochukwu, in order to place them in a better position to contribute meaningfully towards uplifting the industry upon graduation.

In a study on the development and validation of a questionnaire on teachers' instructional beliefs and practices in education for sustainable development, Sinakuoetal (2021), adopted the steps; survey; interviews: expert team which reviewed the questionnaire in terms of content, structure, lay-out and language; cognitive testing; and testing the structure of the questionnaire through pilot study and main run study. Confirmatory Factor Analysis (CFA) was adopted for data Analysis of the pilot study and the main run study while Cronbach's Alpha reliability co-efficient was employed to determine the internal consistency of the items. The result shows four scales with a total of 14 items in each scale. The results further indicate the potential of the questionnaire for Research and Practice in Education for Sustainable Development. The study is related to the present one in that a Research and Development (R&D) design was adopted in the study. However, it differs from it in that while the study under review sought to determine teachers' instructional beliefs and practices in education for sustainable development, the present one is seeking to develop and validate effective instructional strategies for imparting quality management skills into building technology students.

In yet another study, Onwe (cited in Igboko, 2016), conducted a study meant to develop an instructional design for the practical component of building technology for the Nigerian Certificate in Education (Tech.) curriculum. The Research and Development (R&D) design was adopted for the study. It was guided by five research questions and four hypotheses. The population for the study consisted of seventy-two Building Construction Teachers (lecturers and instructors) across 16 Colleges of Education (Tech.). There was no sampling while a structured questionnaire served as the instrument for data collection. Mean, standard deviation, frequencies and percentages were employed in answering the first four research questions while the fifth one was answered by subjecting the developed instructional design to a process of synthetic validation. The hypotheses were tested using t-test statistics and chi-square (X^2). The findings of the study include: study of architectural features on building drawings, visits to building construction sites for hands-on experiences, and demonstrations on setting out, for learning experiences/activities; while instructional materials/facilities should include: leveling instruments, wheel barrows, concrete mixers, trowels, concrete vibrators, wood, sand, blocks, cement and reinforcement rods. The study under review is related to the present one in so many ways, including the adoption of R&D design and the determination of instructional activities and resources for building technology in colleges of education (Tech). However, while the study was on the teaching of practical components of building technology, the present one is on the teaching of quality management skills in building technology.

Igboko (2023), also conducted a study to identify the instructional activities and resources for quality management skills in building construction trade in technical colleges in Nigeria. The study adopted a descriptive survey research design with two research questions and two hypotheses guiding the study. The population for the study was 106. There was no sampling as the population

was considered manageable. Frequencies, mean and standard deviation were adopted in answering the research questions while Analysis of Variance (ANOVA) was adopted in testing the hypotheses. The study found a number of instructional activities and resources considered suitable for inculcating quality management skills in building construction students of technical colleges. The study under review is similar to the present one in that both are focused on instructional activities and resources for quality management skills in building production. However, the study differs from the current one in that while it focused on the identification of instructional activities and resources for quality management skills in building construction trade in technical colleges in Nigeria, the present one is focused on the development and validation of instructional activities and resources for effective inculcation of quality management skills in building technology students of Abia State College of Education (Technical), Arochukwu.

In all, the reviewed studies focused on the development of an instructional design for the practical components of the building technology curriculum of colleges of education (tech) in Nigeria, and the identification of instructional activities and resources for quality management skills in building construction trade in technical colleges in Nigeria. However, none of the studies focused on the development and validation of instructional strategies for effective inculcation of quality management skills in building technology students of Abia State College of Education (Tech.), Arochukwu. This is the gap that the present study is set out to fill.

Statement of the Problem

Quality management skills in the practice of building construction has been found to be a prerequisite for the achievement of buildings that will stand the test of time, and in the process satisfy the utility, health and safety requirements of the owner. However, since the specific objectives and content of quality management skills for the building technology curriculum of Abia State College of Education (Tech.) Arochukwu, in particular and Colleges of Education (Tech.) across the country have already been determined, it becomes imperative to equally develop instructional strategies that will aid the achievement of the specific objectives. If this is not done, lecturers and teachers of building technology will continue to adopt instructional strategies that do not facilitate the achievement of specific objectives of quality management skills. In that wise, they will continue to turn out building technology graduates that lack quality management skills. Such graduates will therefore not have the skills to impart to their own students, thereby denying the building industry the needed skilled manpower in the area of quality management.

Objectives of the Study

The objective of the study was to develop and validate instructional strategies for effective inculcation of quality management skills in building technology students of Abia State College of Education (Technical), Arochukwu. Specifically, the study:

1. determined effective instructional activities for the inculcation of quality management skills in building technology students.
2. determined effective instructional resources for the inculcation of quality management skills in building technology students.
3. determined the efficacy of the developed instructional strategies.

Research Questions

The following research questions guided the study:

1. What are the instructional activities that could be employed for effective

inculcation of quality management skills in building technology students of Abia State College of Education (Tech.) Arochukwu?

2. What are the instructional resources that could be employed for effective inculcation of quality management skills in building technology students of Abia State College of Education (Tech.) Arochukwu?
3. What is the efficacy of the developed instructional strategies?

Hypotheses

The following null hypotheses were tested at .05 level of significance:

1. 1There is no significant difference in the mean responses of Building Construction Teachers, building technology graduates and industrial technical education lecturers on instructional activities suitable for inculcating quality management skills in building technology students.
2. 2: There is no significant difference in the mean responses of Building Construction Teachers, building technology graduates and industrial technical education lecturers on the instructional resources suitable for inculcating quality management skills in building technology students.
3. 3There is no significant difference in the mean scores of students taught using the quality management instructional strategies and those taught using the conventional instructional strategies on the Quality Management Skills Achievement Test.

Methodology

The **s**tudy adopted the Research & Development (R&D) design. According to Gall, Gall and Borg (2007), (R &D) is an industry-based development model in which the findings of research are used to design new products and procedure, which are then systematically field-tested, evaluated and refined until they meet specified criteria of effectiveness, quality or similar standards.

The study was conducted in Arochukwu. The reason for choosing Arochukwu for the study was because a good number of experts, including registered builders, Industrial Technical Education lecturers, and NCE Building Technology graduates were resident there. Also, the town has hadits fair share of the challenges confronting the building industry. So, it was assumed, and rightly so, that the residents would readily identify with the study.

The total population for the study comprised of 43 Building Construction Teachers, 20 building technology graduates, and 23 industrial technical education lecturers (for phase 1); and 20 NCE (300 level) building technology students (for phase II). This gave a total population of 106.

There was no sampling as the population of 106 participants was considered manageable.

Two different instruments were used for data collection in the study. The first was the Instructional Activities and Resources for Quality Management Skills Questionnaire (IARQMSQ) while the second was the Quality Management Skills Achievement Test (QMSAT).

The IARQMSQ instrument was divided into three sections: A, B, and C. Section A sought to elicit information on the personal data of the respondents while sections B and C sought information on the instructional activities and instructional resources respectively suitable for the effective inculcation of quality management skills in building technology students. The QMSAT, on the other hand, was a multiple-choice achievement test intended to measure students' acquisition of quality management skills in building technology. Response to the items was based on a 4-point scale of Very Appropriate, Appropriate, Moderately Appropriate and Not Appropriate. The

following points were assigned to the response options: Very Appropriate (VA) = 4 Points, Appropriate (A) = 3 points, Moderately Appropriate (MA) = 2 points and Not Appropriate (NA) = 1 point. The two instruments, IARQMSQ and QMSAT, were sent to three experts in Industrial Technical Education (building technology option) for both face and content validity. Thereafter, the validated instruments were subjected to reliability test using Cronbach Alpha Coefficient. The Cronbach Alpha Coefficient was considered suitable as the instruments were in multiple response modes. The internal consistencies of the instruments were found to be .85 and .78 for instructional activities and instructional resources respectively.

Research questions 1 to 3 were answered using mean and standard deviation. Further, the hypotheses for the IARQMSQ were tested at 0.05 level of significance using Analysis of Variance (ANOVA) while the hypothesis for the QMSAT was tested at 0.05 level of significance using Analysis of Covariance (ANCOVA). The computation of all generated data was done using the statistical package for social sciences (SPSS) version 20.

The decision rule for research questions 1 and 2 was based on the real limit of numbers; that is, scores ranging from 0.5 to 1.49 were considered not appropriate, those from 1.50 to 2.49, moderately appropriate, those from 2.50 to 3.49 appropriate, and those from 3.50 to 4.00 very appropriate. For hypotheses 1 and 2, accept null hypothesis if $P \leq 0.05$, otherwise reject. For hypothesis 3, accept null hypotheses if f-calculated is less than f-critical (f-cal<f-crit.) otherwise reject null hypotheses if f-calculated is more than f-critical (f-cal>f-crit).

Results

Research Question 1

What are the instructional activities that could be employed for effective inculcation of quality management skills in building technology students of colleges of Education (Tech)?

Data for this research question are analyzed and presented in Table 1.

Table 1
Mean Reponses of Respondents on the Instructional Activities for Effective Inculcation of Quality Management Skills in Building Technology Students

S/N	Instructional Activities for Effective Inculcation of Quality Management Skills in Building Construction Students	N1 = 43 $\overline{X_1}$	N2 = 20 $\overline{X_2}$	N3 = 23 $\overline{X_3}$	$\overline{X}$ G	SD	Remark
1.	Projects on the production, storage, handling and installation of building materials and components	3.58	3.65	3.45	3.57	0.70	VA
2.	Demonstration of the standard of workmanship required for any item of work	3.53	3.39	3.35	3.45	0.70	A
3.	Fieldtrips to the best performing building construction firms and materials production yards	3.44	3.57	3.30	3.44	0.70	A
4.	Exhibition of building materials and components of acceptable quality standards	3.67	3.39	3.30	3.51	0.70	VA
5.	Systematic reporting of the proper techniques and procedures for the execution of work items	2.88	3.13	3.20	3.02	0.89	A
6.	Discussions on the benefits of quality management in building construction	3.09	3.09	3.30	3.14	0.81	A
7.	Collaborative work on problem-solving	3.44	3.30	3.40	3.40	0.72	A
8.	Lectures on the planning, controlling, communicating and motivating skills for quality management	3.30	3.17	3.50	3.31	0.79	A
9.	Scaffolding techniques on working within time and budget	3.09	3.35	3.40	3.23	0.73	A

Cluster Mean = 3.34

Key: N_1 = Building Construction Teachers, N_2 = Building Technology Graduates, N_3 = Industrial Technical Education Lecturers. $\overline{X}_1$ = mean response of Building Construction Teachers, $\overline{X}_2$ = mean response of Building Technology Graduates, $\overline{X}_3$ = Mean response of Industrial Technical Education Lecturers. XG = grand mean, SD = Standard deviation. VA = Very Appropriate, and A = Appropriate.

The result in Table 1 shows the mean responses of Building Construction Teachers, graduates of building technology and industrial technical education lecturers on the appropriate instructional activities for teaching quality management in building technology in colleges of education (tech.). The data reveal that two items were rated very appropriate while the rest were rated appropriate. Again, a cluster mean of 3.34 was obtained for the research question showing that together all the items were found appropriate instructional activities for the quality management component of curriculum 0f colleges of education (tech.). Further, the standard deviation of each of the items was less than 1.00 showing that the responses of each respondent were clustered around the mean, giving the mean values more validity.

Hypothesis 1 ($H0_1$)

There is no significant difference in the mean responses of Building Construction Teachers, building technology graduates and building technology lecturers on the instructional activities for effective inculcation of quality management skills in building technology students of colleges of education (tech.).

Table 2

Analysis of Variance of the Responses of Respondents on the Instructional Activities for Effective Inculcation of Quality Management Skills in Building Technology students in Colleges of Education (Tech.)

S/N	Instructional Activities for Effective Inculcation of Quality Management Skills in Building Construction Students Include:	N_1 = 43	N_2 = 20	N_3 = 23	$\overline{X}G$	SD	F-value	Sig. of F	RMK
1.	Projects on the production, storage, handling and installation of building materials and components	3.58	3.65	3.45	3.57	0.70	0.46	0.63	NS
2.	Demonstration of the standard of workmanship required for various items of work	3.53	3.39	3.35	3.45	0.70	0.60	0.55	NS
3.	Field trips to the best performing building construction firms and materials production yards	3.44	3.57	3.30	3.44	0.70	0.77	0.47	NS
4.	Exhibition of building materials and components of acceptable quality standards	3.67	3.39	3.30	3.51	0.70	2.35	0.10	NS
5.	Systematic reporting of the proper techniques and procedures for the execution of work items	2.88	3.13	3.20	3.02	0.89	1.08	0.34	NS
6.	Discussions on the benefits of quality management in building construction	3.09	3.09	3.30	3.14	0.81	0.50	0.61	NS
7.	Collaborative work on problem-solving	3.44	3.30	3.40	3.40	0.72	0.27	0.77	NS
8.	Lectures on the planning, controlling, communicating and motivating skills for quality management	3.30	3.17	3.50	3.31	0.79	0.93	0.40	NS
9.	Scaffolding techniques on working within time and budget	3.09	3.35	3.40	3.23	0.73	1.62	0.20	NS

Key: N_1 = Building Construction Teachers, N_2 = Graduates of Building Technology, N_3 = Industrial Technical Education Lecturers. $\overline{X}_1$ = mean response of Building Construction Teachers, $\overline{X}_2$ = mean response of Building Construction graduates, $\overline{X}_3$ = mean response of Industrial Technical Education Lecturers. XG = grand mean, SD = standard deviation. F is significant at $p \leq 0.05$.

The analysis in Table 2 shows that there was no significant difference in the mean responses of the respondents on all the nine items that make up the instructional activities for quality management in building technology. This therefore means that the null hypothesis of no significant difference is upheld in all the instances in table 2.

Research Question 2

What instructional resources are necessary for teaching quality management skills as part of the building technology curriculum of colleges of education (tech)?

Table 3

Mean Responses of the Respondents on the Instructional Resources Necessary for the Inculcation of Quality Management Skills in Building Technology students of colleges of Education (Tech).

S/N	Instructional Resources Necessary for Effective Inculcation of Quality Management Skills in Building Technology Students	$N_1 = 43$	$N_2 = 20$	$N_3 = 23$	$\overline{XG}$	SD	RMK
10.	Quality fine and coarse aggregates	3.70	3.57	3.50	3.62	0.69	VA
11.	Quality reinforcement bars	3.63	3.52	3.60	3.59	0.69	VA
12.	Cement of different types	3.30	2.86	2.80	3.07	0.69	A
13.	Tools/facilities such as: wheel barrows, spades, gauge boxes, weighing machines, vibrators, rammers, block moulds, block moulding machines, concrete mixers and mixing platforms	3.74	3.17	3.45	3.52	0.70	VA
14.	Copies of construction programmes	3.35	3.35	3.35	3.35	0.73	A
15.	Copies of construction cost plans	3.23	3.17	3.50	3.28	0.75	A
16.	Architectural drawings, schedules and specifications	3.63	3.48	3.65	3.59	0.62	VA
17.	Structural designs, schedules and specifications	3.51	3.22	3.75	3.49	0.70	A
18.	Service engineering designs, schedules and specifications	3.12	3.09	3.65	3.23	0.89	A
19.	The National Building Code	3.49	3.43	3.50	3.48	0.70	A
20.	Other building regulations	3.35	3.26	3.45	3.35	0.70	A
21.	Resource persons, such as: registered builders; manufacturers of quality building materials, tools and equipment; managers of top-ranking building construction firms; and industrial technical education experts.	3.47	3.48	3.65	3.51	0.72	VA

Cluster Mean = 3.42

Key: N1 = Building Construction Teachers, N2 = Building Technology Graduates, N3 = Industrial Technical Education Lecturers. $\overline{X}_1$ = mean response of Building Construction Teachers, $\overline{X}_2$ = mean response of Building Technology graduates, $\overline{X}_3$ = mean response of Industrial Technical Education Lecturers. XG = grand mean, SD = standard deviation.

In Table 3, the mean ratings of the respondents on what should be included as suitable instructional resources for teaching quality management in building technology are displayed. The data reveal that five of the items were rated very appropriate while the remaining seven were rated appropriate. A cluster mean of 3.42 further shows that all the items are appropriate instructional resources for quality management in building construction. Further, the standard deviation of each of the responses to the items was less than 1.00, giving the mean values added validity.

Hypothesis 2 ($H0_2$)

There is no significant difference in the mean responses of Building Construction Teachers, building technology graduates and building technology lecturers of industrial technical education background on the relevant instructional resources for teaching quality management skills in the building technology curriculum of colleges of education (tech).

Table 4
Analysis of Variance of the Responses of the Respondents on the Instructional Resources for Teaching Quality Management Skills in the Building Technology in Colleges of Education (Tech)

S/N	Instructional Resources for Teaching Quality Management Skills in Building Technology	$N_1 = 43$ $\overline{X_1}$	$N_2 = 20$ $\overline{X_2}$	$N_3 = 23$ $\overline{X_3}$	$\overline{X}G$	SD	F-Value	Sig. of F	RMK
10.	Quality fine and coarse aggregates	3.70	3.57	3.50	3.62	0.69	0.64	0.53	NS
11.	Quality reinforcement bars	3.63	3.52	3.60	3.59	0.69	0.17	0.84	NS
12.	Cement of different types	3.30	2.86	2.80	3.07	0.96	2.65	0.08	NS
13.	Tools/facilities such as: wheel barrows, spades, gauge boxes, weighing machines, vibrators, rammers, block moulds, block moulding machines, concrete mixers and mixing platforms.	3.74a	3.17b	3.45	3.52	0.70	5.71	0.07	NS
14	Copies of construction programmes	3.35	3.35	3.35	3.35	0.73	0.00	1.00	NS
15	Copies of instruction cost plans	3.23	3.17	3.50	3.28	0.75	1.20	0.31	NS
16	Architectural drawings, schedules and specifications	3.63	3.48	3.65	3.59	0.62	0.54	0.59	NS
17	Structural designs, schedules and specifications	3.51ab	3.22b	3.75	3.49	0.70	3.33	0.06	NS
18	Service engineering drawings, schedules and specifications	3.12	3.09	3.65	3.23	0.89	3.01	0.06	NS
19	The National Building Code	3.49	3.43	3.50	3.48	0.70	0.06	0.94	NS
20	Other building regulations	3.35	3.26	3.45	3.35	0.70	0.39	0.68	NS
21	Resource persons such as: registered builders, manufacturers of quality building materials, tools and equipment; managers of top-ranking building construction firms: and industrial technical education experts.	3.47	3.48	3.65	3.51	0.72	0.48	0.62	NS

Key: N_1 = Building Construction Teachers, N_2 = Building Technology Graduates, N3 = Industrial Technical Education Lecturers. $\overline{X}_1$ = mean response of Building Construction Teachers, $\overline{X}_2$ = mean response of Building Technology graduates, $\overline{X}_3$ = mean response of Industrial Technical Education Lecturers. XG = grand mean, SD = standard deviation. F is significant at $p \leq 0.05$.

The analysis in Table 4 reveals that there was no significant difference in the mean responses of the respondents on all twelve items.

Research Question Three

What are the means and standard deviations of the scores of students taught using the quality management instructional strategies and those taught using the conventional instructional strategies on the Quality Management Skills Achievement Test?

Table 5: Means and Standard Deviations of Students' Scores

Group	Type of Test	Mean ($\bar{x}$)	Std. Deviation
Experimental	Pre-test	42.90	5.30
Experimental	Post-test	70.10	14.19
Control	Pre-test	42.70	5.31
Control	Post-test	47.50	5.02

The results show that both groups had similar mean scores in the pre-test. However, the experimental group recorded a higher mean score on the post-test compared to the control group, indicating the effectiveness of the instructional strategy.

Hypothesis Three

Ho_3 : There is no significant difference in the mean scores of students taught using the quality management instructional strategies and those taught using the conventional instructional strategies.

Table 6: Analysis of Covariance (ANCOVA) Summary

Source	Df	Sum of Squares	Mean Square	F	Sig.
Between Groups	1	2556.31	2556.31	21.34	0.000
Covariate (Pre-test)	1	3.06	3.06	0.03	0.875
Error	17	2036.34	119.78		
Total	19				

The ANCOVA result indicates a significant difference between the two groups ($p < 0.05$), in favour of the experimental group. Hence, the null hypothesis is rejected.

Discussion of Findings

The findings of the study in Table 1 showed that the nine instructional activities determined in the study were all rated appropriate by the respondents. It therefore follows that all nine instructional activities are suitable for the inculcation of quality management skills in building technology students of colleges of education (tech.). This is in line with Amiri, etal (2025), who opine that instruction should be grounded in strategies that impact how students engage with content, learn with each other, and build skills for a lifetime in this age of constantly changing classrooms and rapid progress in technology. It is also in line with Ahmed and Ahmed (2023), who stressed the need for instructional activities to be based on real-life experiences to help students transform knowledge or information into their personal knowledge which they can apply in different situations and hence prepare them for future life. Again, there was no significant difference in the mean responses of the respondents on the instructional activities. This shows that all the respondents are in agreement on the effectiveness of the nine instructional activities in the inculcation of quality management skills in building technology students. This therefore means that the null hypothesis of no significant difference is upheld in all the instances.

The findings of the study in Table 2 showed that all twelve instructional resources identified for the study were rated appropriate by the respondents. This therefore

indicates that the 12 instructional resources are considered effective for the teaching of quality management skills in building technology in colleges of education (tech). This is in line with Zuraisham, etal (2025), who maintain that effective instructional resources enrich the teaching and learning process by stimulating the interest and curiosity of students in the subject matter thereby ensuring active participation and deeper comprehension. The finding is also in line with Igboko (2016), who found that the use of materials/facilities such as wheel barrow, concrete mixer, concrete vibrator, sand, blocks, cement, reinforcement bars are particularly very effective in teaching practical components in building technology. Further, there was no significant difference in the mean responses of the respondents on any of the instructional resources.

The findings of the study in table 6 revealed that the use of quality management skills instructional strategies significantly improved students' performance compared to the conventional strategies, in the acquisition of quality management skills in building technology. This aligns with modern pedagogical approaches that emphasize active learning and skill acquisition (Amiri, etal 2025; Ahmed and Ahmed, 2023; and Igboko, 2016).

Conclusion

The findings of the study have shown that the identified instructional strategies are very effective in the impartation of quality management skills in building technology students of Colleges of Education (Technical), Arochukwu. This means that, if adopted, the instructional strategies will help to produce building technology graduates who are quality conscious and who will in turn impart the same consciousness into their students for the general good of the building industry and the society at large.

Recommendations

Following the findings of the study, the following recommendations are put forward:

1. 1). The National Commission for Colleges of Education (NCCE) should initiate revision of the present minimum standards curriculum in order to integrate the identified Quality Management Skills Instructional Strategies into the curriculum.
2. 2). Scholars should begin the production of textbooks that highlight the importance of the identified instructional strategies and the urgency of their adoption in teaching and learning of quality management skills in building technology in colleges of education (tech.).

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