

## Capacity Building Skills for Teachers of Block/Bricks Laying and Concreting for Effective Teaching of Computer Aided Drafting in Technical Colleges in Rivers State

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**ABSTRACT:** The study examined capacity building skills for teachers of block/bricks laying and concreting for effective teaching of Computer Aided Drafting (CAD) in government technical colleges in Rivers State. One research question was answered with one corresponding null hypothesis that was formulated and tested at 0.05 significance level. The population of the study was 23 Block/Brick Laying and Concreting personnel comprising 16 teachers and 8 instructors from four technical colleges in Rivers State. The instrument for the data collection was a self-structured questionnaire designed after the pattern of Likert-5 point rating scale. The instrument was validated by two experts in the Department of Vocational and Technology Education in Rivers State University, Port Harcourt. The reliability of the instrument was established through test-retest method for different sections of the instrument. Research question was answered with Mean and Standard Deviation while hypothesis was tested using independent sample t-test. The study found that majority of the skills outlined in the study are needed by teachers of Block/Bricks Laying and Concreting for effective teaching of Computer Aided Drafting (CAD) in Government Technical Colleges in Rivers State. Based on the finding of the study, it was recommended that workshops and seminars should be organized by government for teachers of Bricks/Block Laying and Concreting on basic design process, drafting materials and equipment, working drawing, sketching and designing and computer aided drafting in order to build their capacity.

**Keywords:** Capacity Building Skills, Effective Teaching, Computer Aided Drafting

*Submitted: 04-06-2022; Revised: 12-06-2022; Accepted: 26-06-2022*

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ISSN-E: 2828-1519

<https://journal.formosapublisher.org/index.php/eajmr/index>

## **INTRODUCTION**

Teachers have one of the most demanding vocations in the world and in order to fulfill their important roles with excellence, they need training, motivation as well as regular mental, emotional and psychological rejuvenation and upgrading. Hence educational systems in the world over recognize the importance of the teacher which is evident by the resources spent on teacher capacity building (World Bank, 2010). However, the issues have been about building an effective model and mechanism that would develop and enhance the teachers' capacity and provide them avenues for professional development. Professional development is specific training given to an individual for upgrade in a chosen career. These training are needed by teachers in order to fit into the 21<sup>st</sup> century especially in Technical Colleges in Rivers State.

Technical College according to Abdullahi (2011) is that institution which provides through training with the adequate knowledge, skills and attitudes for gainful employment under the guidance of a teacher in a related occupation using workshops as work places for practices. Technical College is an institution where students are taught skill acquisition. Upon completion of their courses, they either gainfully employed or they choose further their education. Technical college plays vital roles in Nigeria. They train and produce technician for industry, impart vital technical skills in the youths, help towards the goal of self-employment and job creation and in the struggle towards technological advancement and acquisition (UNESCO, 2011). Through technical colleges, youths acquire such skills as skilled technicians, bricklayers, carpenters, painters, and auto mechanics, electrical/electronic technicians. Technical College essentially provide general education, provide training in selected occupation, help trainees to develop the requisite skills and abilities necessary for securing and retaining a job, help in creating employment and self-employment. Technical college training is the education for the acquisition and development of skills, competencies and attitudes which are necessary for poverty reduction. Skill development and competencies could be acquired in Technical College through teaching and learning process that involves the service of a teacher.

A teacher of Block/Bricks Laying and Concreting in technical college is someone who has undergone the necessary and recommended training in Building Technology (Block/Bricks Laying and Concreting) from recognized institutions and has the responsibility of teaching the content of Block/Bricks Laying and Concreting effectively in Technical Colleges. However, as it is the responsibility of teachers of Block/Bricks Laying and Concreting to teach the course outline, there is need for competency. Competence is the ability to do something well. There are various approaches and definitions of the concept of competence. Eraut (as cited in Orji & Abolarin, 2012) defined competence as the

ability to perform the task and roles required to the expected standards. According to Weinert as cited in Okwelle and Allagoa (2014), competencies are the positive combinations of knowledge, ability and willingness in the ability of the individual to cope successfully and responsibly with changing situation. Similarly, Orji and Abolarin (2012) refer to competence as the effectiveness or ability of anyone concerned to apply the acquired knowledge and skill to achieve desired results. Nussel, Inglis and Wiersma (2016), explained that competency is a functional ability to apply to practical situation the essential principles and techniques of a particular subject matter or field. Functional ability of teachers of Block/Bricks Laying and Concreting to demonstrate knowledge, skills and attitudes required in teaching in Technical Colleges indicates competence. If on the other hand, one could not satisfactorily demonstrate knowledge, skills and attitudes required in the teaching, then the individual has a gap which shows lack of competence. To fill this gap, the individual (teacher) requires capacity building.

Capacity building can be described as a retraining given to serving teachers to develop a certain skill or competence, or for general upgrading of performance ability. According to Olaitan, Alaribe and Nwobu (2009), capacity building is an attempt aimed at increasing an individual's ability to perform a job or task. It is geared towards making improvement on what an individual is already doing, to increase productivity. Capacity building refers to establishing resources required to fulfill a mission or achieve a goal. It was further asserted that it is a process of developing and strengthening the skills, instincts, abilities, process and resources that one need to survive, adapt and thrive in the fast changing world of technology (Olaitan, Asogwa & Eze, 2011).

It is the process through which individuals, groups, organizations and societies enhance their ability and meet development challenges. Capacity building is the effort geared towards improving the level of knowledge, skills and attitude possessed by an individual for proficiency in a given task or job. Capacity building of teachers of Block/Bricks Laying and Concreting is the effort geared towards increasing the level of knowledge, skills and attitude possessed by teachers of Block/Bricks Laying and Concreting to enable them perform effectively towards enhancing proficiency, in meeting the objectives of Technical College as enshrined in the National Policy on Education of the Federal Republic of Nigeria (FRN, 2013). However, many factors may be responsible for lack of required skills in Block/Bricks Laying and Concreting students. One of such factors is the inability of teachers of Block/Bricks Laying and Concreting to equip themselves with modern technologies to ensure possession of required skills. This evidence requires the assessment of the teachers for the level of quality possessed. Assessment according to Offorma

(2014) is the process of determining the worth of something or performance of individuals on a skill based on measurement. Assessment will also provide information on the level of skill needed for an acceptable or target standard. The difference between the standard or performance needed and the level of performance possessed by the teachers will indicate a capacity gap which needs to be acquired through capacity building efforts.

Anaekwe (2017) refers to a need as a shortfall between what is available and what is expected. Osinem and Nwoji (2010) opined that need may arise anytime an actual condition differs from a desired condition in the human or people or aspect of organization performance. Hence, for Technical College students to be well trained in Block/Bricks Laying and Concreting, their teachers must possess the needed skills through improvement training for teaching the course. Possession of needed skills by teachers enhances effective teaching and acquisition of skills by the students in Block/Bricks Laying and Concreting.

Block/Bricks Laying and Concreting is offered at both intermediate and advanced levels in Technical Colleges. The curriculum of intermediate Block/Bricks Laying and Concreting in addition to what may be termed general education subjects such as Mathematics, English Language, Physics, Chemistry, Social studies, etc has the core trade subjects to include: Introduction to Building Construction, Concreting, Block laying, Bricklaying, surveying, Technical Drawing, Building Drawing and Construction Management. Block/Bricks Laying and Concreting operations in the Technical College curriculum involve the skills required in accomplishing given tasks in Mixing of Mortars by hand, Moulding of Blocks, Laying of Blocks, Rendering of Walls, Wall Tiling, Pointing Top Walls and Laying of Curved Walls (Arches). It also involves Workability Test on Concrete Slump Test), Placing of Concrete, Application of Admixture to Concrete, Compaction, Curing of Concrete and Fixing of Concrete Joint Materials.

The students will perform these operations using tools and necessary equipment while teachers or examiners assess their performance based on their skills and competencies. Block/Bricks Laying and Concreting operations are based on actual jobs and not pseudo jobs. The training should be carried out to the extent where it gives the trainee a productive ability with which he can secure and hold employment and be able to profit by it. To achieve such level, proper instructional/training materials and skills must be utilized in the course of instruction. The use of training materials as Ogwa (2011) put it, involves using materials and skills that are most appropriate and commonly available in communicating more correctly and practically the concepts of technology. Therefore, for Technical College students to be well trained in Block/Bricks

Laying and Concreting, the content of the course must be utilized effectively. This also implies that teachers must improve to possess the required relevant skills needed for teaching the course. This means that teachers of Block/Bricks Laying and Concreting in Technical Colleges needs capacity building to be able to teach and delivered effectively the course content.

Capacity building entails investment made with the purpose of enhancing the ability of individuals/workforce/organizations to achieve their development goals. The United Nation Development Programme (UNDP) (2010) defines capacity building as activities which strengthen the knowledge, abilities, skills and behaviour of individuals and improve institutional structures and processes such that the organization can efficiently meet its mission and goals in a sustainable way. UNDP further stated that capacity building is much more than training and includes the following: human resources development, organizational development, institutional and legal framework development. It is geared towards making improvement on what an individual is already doing, to increase productivity. Capacity building of teachers of Block/Bricks Laying and Concreting is the effort geared towards increasing the level of knowledge, skills and attitude possessed by teachers of Block/Bricks Laying and Concreting to enable them perform effectively towards enhancing proficiency, in meeting the objectives of technical education in the Polytechnics and Colleges of Education in Nigeria.

Block/Bricks Laying and Concreting is offered at both intermediate and advanced levels in Technical Colleges. The curriculum of intermediate Block/Bricks Laying and Concreting in addition to what may be termed general education subjects such as Mathematics, English Language, Physics, Chemistry, Social studies, etc has the core trade subjects to include: Introduction to Building Construction, Concreting, Block Laying, Brick Laying, Land Surveying, Quantity Surveying, Technical Drawing, Building Drawing and Construction Management. At the end of the programme, the students are registered to take one or all of the technical certificate examinations listed below:

- i. National Business and Technical Examination Board (NABTEB)
- ii. Trade Test III/II
- iii. Federal Craft Certificate Examination

The National Business and Technical Education Board (NABTEB) Examination in Block/Bricks Laying and Concreting according to NABTEB (2014) consists of written examinations and practical test in the above mention papers exception of English Language, Mathematics, Social Studies and Construction Management which are purely based on written examination. In each level of the examination, the candidates are expected to pass in the written paper(s) as well as the practical test to earn a certificate.

The National Board for Technical Education (NBTE, 2012) opined that Block/Bricks Laying and Concreting operations in the Technical College curriculum involve the skills required in accomplishing given tasks in Mixing of Mortars by hand, Moulding of Blocks, Laying of Blocks, Rendering of Walls, Wall Tiling, Pointing Top Walls and Laying of Curved Walls (Arches). It also involves Workability Test on Concrete Slump Test, Placing of Concrete, Application of Admixture to Concrete, Compaction, Curing of Concrete and Fixing of Concrete Joint Materials. The students will perform these operations using tools and necessary equipment while teachers or examiners assess their performance based on their skills and competencies. Block/Bricks Laying and Concreting operations are based on actual jobs and not pseudo jobs. The training are carried out to the extent where it gives the trainee a productive ability with which they can secure and hold employment and be able to profit by it. To achieve such level, proper instructional/training materials and skills must be utilized in the course of instruction. The use of training materials as Ogwa (2011) put it, involves using materials and skills that are most appropriate and commonly available in communicating more correctly and practically the concepts of Block/Bricks Laying and Concreting Technology.

Computer Aided Design that is commonly known as AutoCAD is a software application for writing and design 2D and 3D. The use of this software came on stage during the month of December Nineteen Hundred and Eighty-Two (1982). The AutoCAD or computer aided design machine has been a great help to engineers and also for several architectures and builders that are finding it impossible to deal with drawings and plans of the project engineering work and then bring on the verge of perfection. AutoCAD is a software application for both 2D and 3D computer-aided design (CAD) and drafting - available since 1982 as a desktop application and since 2010 as a mobile web- and cloud-based app, currently marketed as AutoCAD 360. Developed and marketed by Autodesk, Inc., AutoCAD was first released in December 1982 – having been purchased a year prior in its original form by Autodesk founder John Walker. The software is currently marketed in its eighteenth generation.

Computer Aided Design (CAD), also known as Computer-Aided Design and Drafting (CADD), is the use of computer systems to assist in the creation, modification, analysis, or optimization of a design (Herron, 2012). Computer-aided drafting describes the process of creating a technical drawing with the use of computer software. CAD software is used to increase the productivity of the designer, improve the quality of drawings, improve communications through documentation, and to create a database for manufacturing. CAD output is often in the form of electronic files for printing or operations. CAD software uses either vector-based graphics to depict the objects of traditional drafting, or may also

produce raster graphics showing the overall appearance of designed objects, that is why it is the most suitable in facilitating electrical drawings/drafting (Narayan, 2008).

Unlike the manual drafting of Block/Brick Laying and Concreting drawing, the output of CAD conveys information such as materials, processes, shapes and tolerances, according to the application-specific conventions. Hence Block/Brick Laying and Concreting drafting using manual can suffer so much errors in accuracy, dimension, lines, space and curves as compared to CAD in live projects. Hence, with the use of CAD all these errors can be eliminated. CAD is an important industrial art extensively used in many applications, including automotive, shipbuilding, industries, architectural and engineering and many more (Farin, 2018). Due to its enormous economic importance, CAD has become a major driving force for research in computational technology like electrical engineering, computer graphics (both hardware and software), and discrete differential geometry (Pillers, 1998). The design of technology and geometric models for object shapes and particularly in Block/Bricks Laying and Concreting is occasionally called Computer-Aided Geometric Design (CAGD).

According to Carlson (2003), the goal of CAD systems is to increase efficiency which means, if applied in Block/Bricks Laying and Concreting drafting, efficiency and productivity may be enhanced. Although CAD is not an easy method that gives newcomers flexibility on geometrical principles and solid modeling, but with consistency, learning is made easier. CAD is also used in the design of tools and machinery and in the drafting and design of all types of buildings, from small residential types (houses) to the large commercial and industrial structures (hospitals and factories).

There are different types of Computer Aided Design (CAD) software, each requiring the operator to think differently on how to use them and design their desired components in different manner. For an example; Auto CAD, Wireframe CAD, Solid Modeling CAD, Freeform Surface CAD etc. There are also many producers of the lower-end 2D systems, including a number of free and open source programs. Each of them provides an approach to drawing process without confusion over accuracy of scales in drawing, since drawings can be adjusted as required during the creation of the final draft. Giving the impression that, CAD may be the package that can turn around Block/Bricks Laying and Concreting drafting in technical colleges in Rivers State of Nigeria.

The different areas in computer of which teachers of Building Drawing and Block/Brick Laying and Concreting practice in technical colleges needs capacity building for competency for effective teaching are basic computer knowledge, 2D CAD and 3D CAD. In the view of Ogunsote and Prucnal-Ogunsote, (2014), a teacher of Building Drawing and Block/Brick Laying and Concreting practice in

technical colleges should possess five (5) CAD competencies to teach effectively in technical colleges. They are basic computer literacy, CAD concepts and theory, graphics software, 2D and 3D CAD and visualization. However, Onah and Okoro (2010) stated that teachers in technical colleges have no skills to impart good knowledge of ICT (CAD) tools to their students due to the fact that they lack the desired training. There is need for teachers of Building Drawing and Block/Brick Laying and Concreting practice in technical colleges to acquire some CAD skills, especially, at present technological ages where information is of global and more effective. It is necessary to make learners in Building Drawing and Block/Brick Laying and Concreting practice in technical colleges become part of this global information system through CAD competent teachers.

### **STATEMENT OF THE PROBLEM**

The inability of Technical College programmes to impart the necessary skills to students has contributed to the high level of unemployment in the country (Usman, 2012). For students of Block/Bricks Laying and Concreting to acquire the required employable skills, teachers must possess reliable knowledge and skills to impart to the learners these skills. Also, Nwamaka and Mbah (2019) asserted that teachers of Block/Bricks Laying and Concreting do not keep their knowledge and skills up to date by periodic retraining and capacity building. This indicates that there is high probability that students of Block/Bricks Laying and Concreting in Technical Colleges will not acquire relevant skills for competence and adaptability in the world of modern technologies, if the teachers do not possess the required skills. The resulting effect of this is the increase in unemployment rate among these students.

A World Bank survey which was reported by Shiundu (2018) also revealed that most graduates are weak in problem solving, business understanding, computer use, team work, and communication skills. The products of Block/Bricks Laying and Concreting are not left out of this problem. In the recognition for the need to improve the content of Block/Bricks Laying and Concreting curriculum to accommodate modern technology, the National Board for Technical Colleges (NBTE, 2013) has included other contents including Automated Computer Assisted Design which is popularly called "AUTOCAD" in it. Autocad is a new tool that is used in teaching modern building construction and other architectural design. Hence, there is need for capacity building for teachers of Block/Bricks Laying and Concreting to be able to effectively use this tool for teaching.

## **OBJECTIVE OF THE STUDY**

The study focused on examining the capacity building skills for teachers of Block/Bricks Laying and Concreting for effective teaching of Computer Aided Drafting (CAD) in Government Technical Colleges in Rivers State.

## **RESEARCH QUESTION**

What are the capacity building skills needed by teachers of Block/Bricks Laying and Concreting for effective teaching of Computer Aided Drafting (CAD) in Government Technical Colleges in Rivers State?

## **HYPOTHESES**

There is a no significant difference in the mean responses of teachers and workshop instructors on the capacity building skills needed by teachers of Block/Bricks Laying and Concreting for effective teaching of Computer Aided Drafting (CAD) in Government Technical Colleges in Rivers State.

## **METHODOLOGY**

The study was carried out in Rivers State which is the southern part of Nigeria. The state comprised of 23 Local Government Areas. The choice of Rivers State as area of the study was informed by the presence of four technical colleges with NBTE accredited trades that offer Block/Brick Laying and Concreting courses. Base on this, the researcher was certain that there is provision for qualitative information needed for the study. The study adopted the descriptive research survey design. The target population was 23 Block/Brick Laying and Concreting (15 teachers and 8 instructors) from the four Technical College in Rivers State. The study adopted the entire (census study) population of Block/Brick Laying and Concreting teachers and instructors, thus no sample technique was adopted. The instrument for data collection was a self-structured questionnaire designed in a 5-point likert rating scale of Highly Needed (HN), Needed (N), Undecided (U), Lowly Needed (LN) and Not-Needed (NN) with numerical values of 5, 4, 3, 2 and 1 respectively. The reliability of instrument was tested using the test-retest method; the instrument yielded a reliability coefficient of 0.85. Data was analyzed using mean and standard deviation with a criterion mean value of 3.00 and above while T-test was used to test the null hypotheses at significance level of 0.05.

## RESULTS

### Research Question 1

What are the capacity building skills needed by teachers of Block/Bricks Laying and Concreting for effective teaching of Computer Aided Drafting (CAD) in Government Technical Colleges in Rivers State?

**Table 1:** Mean Responses on Capacity Building Skills Needed in Effective Teaching of Computer Aided Drafting (CAD)

S/N	Item Statement	Teachers			Workshop Instructors		
		$\bar{X}_1$	SD <sub>1</sub>	RMK	$\bar{X}_2$	SD <sub>2</sub>	RMK
1	Ability to start window button to display the start menu	3.5 3	1.03	Needed	3.64 9	1.0	Needed
2	Ability to move the mouse pointer onto CAD program	3.6 4	1.19	Needed	3.81 9	0.5	Needed
3	Open CAD exiting document	3.5 0	0.80	Needed	4.11 8	0.8	Needed
4	Read and interpret drawings	4.1 3	0.88	Needed	4.13 1	1.2	Needed
5	Ability to use two dimensions (2D) in CAD program	4.2 5	0.97	Needed	3.63 4	0.8	Needed
6	Ability to use three dimensions (3D) in CAD program	3.8 9	1.19	Needed	0.88 1	0.3	Needed
7	Design a building to face the equator or (a few degrees to the east to capture the moving sun).	3.1 0	0.75	Not Needed	3.33 3	1.0	Not Needed
8	Place windows during design to face midday sun in the winter and be shaded in the summer.	3.6 4	0.82	Not Needed	3.11 6	0.7	Not Needed
9	Design a cool roof or green roof.	3.1 4	0.87	Not Needed	3.04 7	0.8	Not Needed
10	Access CAD drawing from internet.	3.6 4	1.19	Needed	3.64 0	0.8	Needed
11	Modify drawing on CAD	3.8 1	0.67	Needed	3.52 1	1.1	Needed
12	Organize and print drawing in CAD	3.5 5	0.51	Needed	4.06 8	1.0	Needed
13	Retrieve CAD drawing from internet	4.1 3	1.11	Needed	3.70 8	0.6	Needed

14	Store drawing in CAD	3.6	1.11	Needed	3.53	1.1	Needed
		0				2	
	<b>Average Mean/SD</b>	<b>3.6</b>	<b>0.94</b>	<b>Needed</b>	<b>3.44</b>	<b>0.8</b>	<b>Needed</b>
		<b>8</b>				<b>8</b>	

**Source:** *Researcher's Field Result; 2021*

The result in Table 1 shows the response of teachers and workshop instructors on capacity building skills needed by teachers of Block/Bricks Laying and Concreting for effective teaching of Computer Aided Drafting (CAD) in Government Technical Colleges in Rivers State as well as their level of decision on a particular item. The study found that majority of the skills outlined in the study are needed by teachers of Block/Bricks Laying and Concreting for effective teaching of Computer Aided Drafting (CAD) in Government Technical Colleges in Rivers State.

#### *Hypotheses 1*

There is a no significant difference in the mean response of teachers and workshop instructors on the capacity building skills needed by teachers of Block/Bricks Laying and Concreting for effective teaching of Computer Aided Drafting (CAD) in Government Technical Colleges in Rivers State.

**Table 2:** t-Test Analysis on Computer Aided Drafting (CAD) in Government Technical Colleges

S/N	$\bar{X}$	SD	N	df	A	t-cal	t-crit	Remark
Teachers	3.68	0.94	15	21	0.05	0.56	1.96	Accepted
Instructors	3.44	0.88	8					

**Source:** *Researcher's Field Result; 2021* Accept Ho if  $t\text{-cal} \leq t\text{-crit}$ , Otherwise Reject Ho.

Since the calculated value of t ( $t_{cal} = 0.56$ ) is less than the critical value of t ( $t_{crit} = 1.960$ ) at 0.05 level of significance, the null hypothesis was accepted. This implies that there is a no significant difference in the mean response of teachers and workshop instructors of Block/Bricks Laying and Concreting on the capacity building skills needed by teachers of Block/Bricks Laying Concreting for effective teaching of Computer Aided Drafting (CAD) in Government Technical Colleges in Rivers State.

*Discussion of Findings*

**Capacity Building Skills for Effective Teaching of Computer Aided Drafting (CAD) in Government Technical Colleges in Rivers State**

The results from Table 1 revealed that capacity building skills of teachers of Block/Bricks Laying and Concreting for effective teaching of Computer Aided Drafting (CAD) in Government Technical Colleges in Rivers State include ability to start window button to display the start menu, ability to move the mouse pointer onto CAD program, open CAD exiting document, read and interpret drawings, ability to use two dimensions (2D) in CAD program, ability to use three dimensions (3D) in CAD program, Organize and print drawing in CAD and Store drawing in CAD among others. These findings are in line with Goetsch et al., (2010) as stressed that what user of technical drawing, drafting, and CAD should learn depends on how they will use technical drawing in their jobs such as ability to use two dimension (2D) or three dimension (3D) and so on. The findings of the study also agree with that of Usman (2006) who opined that Computer Aided Design is a system of construction drawing that uses a computer to eliminate repetitive drawing chores and the increase.

**CONCLUSIONS AND RECOMMENDATIONS**

Conclusively, capacity building skills of Block/Bricks Laying and Concreting in Government Technical Colleges in Rivers State are determinant factor for functional training. Students of technical college at all levels can only acquire needed skills for employment after graduation if they acquire the required skills. For the students to possess these skills, there is need to build the capacity of teachers of Block/Bricks Laying and Concreting based on the findings of this study especially in the computer age where every works and activities are done using computer. The study thus that workshops and seminars should be organized by government for teachers of Bricks/Block Laying and Concreting on basic design process, drafting materials and equipment, working drawing, sketching and designing and computer aided drafting in order to build their capacity. This will help them in effective teaching of Bricks/Block Laying and Concreting practices such as walling, flooring among others.

**FURTHER STUDY**

The following is suggested for further study; strategies of enhancing teachers' capacity for effective teaching of Block/Bricks Laying and Concreting using computer application

## ACKNOWLEDGMENT

The researcher acknowledges all those who provide the necessary data for carrying out this study.

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